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ECONOMY IN THE MANAGEMENT OF THE CONTRACTING BUSINESS.

It has been said that economy is the road to prosperity. If the term economy be properly defined, this statement is largely correct. However, there are not a few business and professional men who always practice what they feel sure is the strictest economy, and are otherwise constantly alert to their interests, who, nevertheless, fall far short of that measure of success which their talents and efforts should insure. Such failures are, in many cases, contributed to in a very large degree by distorted and incorrect ideas as to what real economy is. In other words, it may happen that the business man in his efforts to save pennies loses pounds.

Illustrations of this sort of thing may be found in almost any line of business without difficulty. For example, the electrical contractor who, with a view to keeping overhead expenses low, devotes much of his own time to matters of office routine which could easily be handled by a low-salaried assistant is liable to become the unwitting victim of a policy which will speedily and seriously handicap his business. On the other hand, it must be admitted that a practice worse perhaps than the one just referred to is sometimes allowed a place in the contracting business. This is found where the contractor allows important details in connection with the management of his office to go without any adequate attention at all. The difficulty of getting some electrical contractors to answer important business letters with reasonable promptness has been the subject of comment in many quarters. It has often proved inconvenient and annoying to officials of contractors' associations and to others having interests in common with members of the craft. Attempts to ascribe this to any general lethargy or shiftlessness on the part of contractors are unjust and improper. In the majority of cases of this kind the trouble is that the contractor hasn't the time to look after such matters properly himself and that he hasn't come to a realization of the fact that it is good economy to pay some one else to do it for him. He is busy with matters which he feels he cannot neglect, and affairs, immediate attention to which does not seem essential to finishing the day's work, must wait.

It is not intended, of course, to assert or even insinuate that conditions such as those mentioned above are general in the contracting field. It is simply meant to deplore the fact that mistakes of this

kind are allowed to prevail at all. The contractor who is in the work to succeed, and who is in a locality where there is room for his services, usually practices extremely poor economy if he allows clerical work to occupy much of his own time, or if he permits his office to be run along lines other than those of strictly modern and high-class business practice.

THE CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

One of the most important conventions in the history of the American Institute of Electrical Engineers has been held at Boston during the past week. The week has been filled with hard working days, sessions being held in the morning and afternoon of Tuesday, Wednesday, Thursday and Friday. All told there were 60 papers scheduled for presentation, these covering broadly sections devoted to high-tension transmission, electrochemistry, electrophysics, illuminating engineering and electric lighting, railway electrification, telephony and telegraphy, electrical measurements, power-station work, and industrial-power applications, and educational features of electrical engineering.

The Entertainment Committee had provided a most enjoyable and elaborate series of events, the ladies being especially well provided for. Despite the warm weather there was quite a large registration, and the convention as a whole has been a thoroughly profitable and enjoyable one. A full report of the proceedings will be published in the next issue.

THE PROPER TREATMENT OF COMMUTATORS AND BRUSHES.

As most electricians know, a very large part of the attention required by direct-current dynamos and motors must be given to the commuators and brushes. The proper treatment of these is therefore a fruitful source of discussion among practical men who have to do with the operation of direct-current machines. While much of the matter on this subject appearing in technical publications from time to time is decidedly good, some of it is of such a character as to induce the inexperienced operator to resort to an excessive use of foreign substances on commutators and brushes. If the commutator be kept round, and smooth and clean, and the brushes in proper adjustment, there should be but little trouble from sparking or heating in the operation, at or below the rated load, of a dynamo or motor of any of the usual types—it being assumed, of course, that brushes of the right sort are used. The common practice of applying vaseline or oil to a commutator whenever a spark appears without any attempt to locate the cause of it is as bad as it is common. When these lubricants, or even the best of the commutator compounds, have to be used at all they should be applied in very small quantities usually, and the necessity of frequent applications can be taken as a certain indication that something is wrong with the machine.

An experience is recalled here in which it suddenly became impossible to hold the voltage on a large alternator at anything like its rated value. After nearly an hour of unsuccessful efforts to find the cause of the disorder it was discovered that an attendant had applied to the commutator of the exciter an excessive quantity of a substance which he had been using in smaller quantities on the commutators of other machines in the building. An application or two of a clean cloth saturated with benzine cleaned the commutator and removed the trouble with the alternator voltage.

Carbon brushes which have been in use in long time may sometimes be improved by the boiling process often recommended, but the writer has found it better to boil them in paraffin than in any sort of oil. When the time for boiling has been reached, however, better results at a smaller cost may very often be had by purchasing a new set of brushes.

PROTECTING THE METER LOOP.

The Department of Electricity of the City of Chicago has incorporated into its rules a requirement that meter loops must be run to the meter from a properly constructed terminal block. The wires between the terminal block and meter are incased in approved flexible tubing and from the block to the cutout they are run in rigid conduit. The cover of any of the terminal blocks used can be readily removed for attaching the conductors, or for disconnecting them when a meter is taken out of service. Neat, safe construction in this part of the circuit is thus insured, and it is also made certain that wires will not be left dangling, hazardous and unsightly, in case a meter is taken down.

The construction is such a good one and is so great an improvement over common practice that a general adoption of this arrangement, or of a similar one, would seem to be desirable. Even in the smaller towns, where electric service is supplied from overhead lines, the service entrance is often made through conduit. This, in fact, is, in the majority of cases, the best way to make it. The addition of the block for the meter loop would not necessitate any considerable extra expense, and would certainly add greatly to the quality of the job.

Aside from the gain in safety and good appearance resulting from the adoption of the construction in question, it promotes convenience. For the installation or removal of a meter where the loop is thus arranged is the simplest sort of process, and the cost of meter installation to the central station is reduced. In Chicago the central-station company is under agreement to take away the wires between the terminal block and the meter whenever the latter has to be taken down. It is probable that an agreement of this sort could easily be secured in other places adopting this method when the advantages to be derived were pointed out.

THE MICHIGAN SECTION CRUISE.

The convention-cruise of the Michigan Section, National Electric Light Association, held aboard the steamer *Majestic*, June 21 to 25, was one of the most enjoyable affairs ever held by Michigan central-station interests. The route selected, to Georgian Bay, through the 30,000 islands, then to Sault Ste. Marie by way of the North Channel and finally to Mackinac Island and return to Port Huron is one of the most beautiful and famous lake trips possible to take and great credit is due the officers of the Section, particularly Herbert Silvester, secretary, for the excellent arrangements made for the comfort and enjoyment of those attending. Great foresight was shown in providing for boat connections, entertainment aboard ship and ashore, the handling of reservations and the arrangement of the many details in connection with a trip of this extent.

The business meetings, of which there were three, were, of course, well attended and the papers, although few in number, were of vital interest and showed much care and thought on the part of the authors. The discussion, however, was light and this brings up the question as to the advisability of holding conventions aboard ship. It is difficult to concentrate one's mind on serious business in a ship's cabin when there is so much to attract on the deck. In the case of the Michigan trip the weather was perfect during the entire cruise and it is safe to state that a majority of those attending the convention looked upon the trip as one for rest and sightseeing rather than one for serious and important business.

However, there is one great advantage of a meeting of this kind which is considerably lessened during a convention in a city, namely the opportunity for members to personally exchange ideas and glean information in this manner. Despite the efforts of the officers, there are always a great many from the smaller companies, who through modesty or for other reasons, will not discuss papers or ask questions on the floor of the convention and a convention aboard ship, therefore, affords an excellent opportunity for privately discussing these questions before and after meetings. Another advantageous feature is the opportunity afforded for central-station men to become better acquainted socially, which is a condition much to be desired. The supply men and manufacturers' representatives also become better acquainted with their customers and competitors, all of which makes for better co-operation in the electrical industry.

There are arguments for and against conventions aboard ship and the subject is one which should be given deep consideration by the executive committees of the various associations. Two important state associations have given the convention aboard ship a fair trial and their decisions regarding the holding of their next annual meeting will be awaited with interest.

ALL-DAY SERVICE FOR THE SMALL CENTRAL STATION.

There are few problems in connection with the electrical industry that are more difficult of a correct solution than that of the really successful operation of the small central station sometimes proves itself to be. The problem here is liable to be especially perplexing if the station serves only one small town in which there are but few shops or manufacturing plants to which power may be sold during daylight hours. If the plant be run only through the night, the number of customers on the lighting circuits is almost sure to be but a rather small fraction of the number that could be connected if continuous service were assured. On the other hand, the day load may be so light as to make continuous operation of the plant decidedly unprofitable.

This matter is one which came up for consideration at the recent convention of the National Electric Light Association, and in discussing it one of the members suggested that it would often be best to install a direct-current plant in the small town and equip this with a storage battery for taking care of the day service. The objection was raised, however, that the storage battery is not sufficiently durable for this sort of service.

So far as durability is concerned, the modern commercial types of storage battery are entirely fitted for this kind of service, where it can be made certain that the battery will receive a reasonable amount of intelligent attention. Where storage batteries have failed in work of this sort the failure has been due, as a rule, to carelessness on the part of the attendants rather than to anything else. When attendants follow the practice of judging the condition of cells by their open-circuit voltage, or when cells are discharged below the critical voltage and frequently left standing for hours in that condition, it is little wonder if the life of the battery is found to be short.

Aside from any question of storage batteries, there is frequently a serious obstacle in the way of direct-current service for the small town. It is the case oftener than not that the town of this sort is scattered over such a wide territory as to make economical direct-current distribution quite impracticable. Here it may therefore be a case of alternating-current service or no service at all.

Alternating-current distribution for the kind of a community under consideration possesses a very material advantage over direct current in that the use of it makes it possible to carry loads quite remote from the generating station. By properly taking advantage of this fact the small central station can sometimes secure a profitable day load, even though the demand for power immediately within the town it serves is inconsiderable. Within a convenient radius of perhaps a majority of the small alternating-current plants an aggressive manager could find load enough to make all-day operation possible. Electric pumping for railways passing through the town, and for the town itself where this patronage could be secured, has sometimes supplied the necessary load.

James D. Reid Memorial.

A movement has been set on foot by the Magnetic Club of New York City to erect a monument in memory of the late James D. Reid, whose grave in Rochester, N. Y., is now marked only by a simple stone. This suggestion has been taken up by several other associations and a joint committee has been formed, of which Charles P. Bruch is chairman, William B. Dunn, secretary, and Albert B. Chandler, treasurer. The committee contains representatives of the Telegraphers' Mutual Benefit Association, the Old Time Telegraphers and Historical Association, the Society of the United States Military Telegraph Corps, the Association of Railway Telegraph Superintendents, the New York Telegraphers' Aid Society, the Magnetic Club and other bodies.

James Douglas Reid was a Scotchman by birth. He came to this country as a young man and in 1845 started in telegraph work. He was engaged with the National Lines and afterwards with the Western Union system. He died on April 28, 1901.

Mr. Reid was the first superintendent of telegraph, one of the organizers and the first president of the Telegraphers' Mutual Benefit Association, one of the organizers of the Old Time Telegraphers and Historical Association, and was actively interested in many other organizations. He has written a history of the telegraph and was the founder and editor of the first electrical paper in the world.

The character and location of the memorial will be decided according to the result of the appeal which is now being made for funds. Contributions should be sent to the treasurer, 253 Broadway, New York City.

Louisville Merger Delayed.

Following agreement between counsel for the City of Louisville and for the Kentucky Electric Company, H. M. Byllesby & Company and other defendants in the injunction suit brought against the public-service company to prevent a merger with the Louisville Lighting Company, Judge Quarles, sitting in the Circuit Court at Louisville, Ky., has issued a temporary restraining order. The order prohibits the electric company from selling its stock to H. M. Byllesby & Company and the latter from receiving it, and enjoins the company to continue competing with the Louisville Lighting Company until the injunction is dissolved. The case will now be carried to the Kentucky Court of Appeals with agreement as to the facts, and the question to be determined by the upper tribunal is whether or not purchase of the Kentucky Electric Company's stock by H. M. Byllesby & Company would constitute a violation of the charter of the company.

The City seems to be much pleased with the development of affairs, as it has been shown that the deal for the transfer of control of the electric company has not been closed. H. M. Byllesby & Company have made it clear that they will not purchase the Kentucky Electric property unless they can secure a clear title and one which is in no danger of being pronounced invalid by the courts. As the Kentucky Court of Appeals will soon begin its summer vacation, the chances are that a decision in the matter will not be reached until the fall, and that for the next several months, at all events, matters will remain in statu quo.

Ocean Weather News to be Supplied by Wireless.

The plan of Prof. Willis L. Moore, chief of the United States Weather Bureau, for the establishment of an international North Atlantic weather service, has been agreed to by the committee of the Radio Telegraph Congress, to which it was referred. This insures its adoption by the congress.

According to the plan as outlined by Professor Moore a median line will be established through the North Atlantic. All ships on either side of the line must make a daily weather observation, which must be sent by wireless telegraphy to other vessels, and thus relayed to the American or European land stations. From these reports weather charts will be constructed and forwarded to the shipping at sea.

It is believed that this service will be of great mutual benefit not only to the marine interests but also to the American and European countries in that it will enable their weather bureaus to predict more definitely storms and abnormal weather conditions that are traveling landward from the sea.

A Fatal Attraction.

Just as scraps of paper are attracted by the electrostatic charge on a vulcanite pen which has been rubbed on the sleeve, so are small insects trespassing too near high-tension conductors, violently attracted by the latter. Escape is impossible unless the conductor should happen to be switched out of circuit before the insect is dead, and in all extra high-tension stations large numbers of dead insects may be seen adhering to transformer leads, switches, lightning arresters, aerial line outlets, and so on—unfortunate victims of a fatal attraction and an invisible bond.

Eight-Hour Day for New England Telephone Employees.

An eight-hour day is promised the employees of the New England Telephone & Telegraph Company not later than January 1 next. The statement is issued by President Jasper N. Keller.

Central-Station Company to Operate Hotel.

It is not often that a central station is called upon to operate a hotel as part of its plant, but that appears to be the situation confronting the Campbell Electric Company, which has been organized in Louisville, Ky., with $50,000 capital stock. It takes over the property of Pike Campbell, proprietor of a small electric light plant and also of the Fifth Avenue Hotel, which was bought by George H. Harries, president of the Louisville Lighting Company, representing H. M. Byllesby & Company, of Chicago. Mr. Campbell has regarded the hotel as a white elephant, and refused to sell the lighting plant unless the hostlery went with it. The new company will operate both, but will try to find a purchaser for the hotel as soon as it can. The incorporators of the new company are: Herbert L. Harries, a son of General Harries; T. B. Wilson, secretary of the Louisville Lighting Company; and Fred A. Nobbe and Isaac Milkewitch, the latter two connected with H. M. Byllesby & Company.

Electric Development Association Organized.

The Electric Development Association was organized at Framingham, Mass., on June 19, as a result of a determination on the part of all the manufacturers, jobbers, contractors, dealers and electric light companies in New England to combine in a united effort to exploit electricity in general and secure a greater development of the electric light industries throughout their portion of the United States. Frank S. Price was elected president; Alfred J. Hixon, first vice-president; S. B. Condit, Jr., second vice-president; John Buckley, secretary; and George M. Stuart, treasurer.

Water Power in Scotland.

According to a paper contributed to the Inverness Scientific Society, Scotland is estimated to possess 1,000,000 horsepower in its water-power resources, and it is pointed out that even if this figure be halved it would still represent, on a 10-hour working-day basis throughout the year, an amount of power equal to that obtained from 3,500,000 tons of coal. On a map accompanying the paper are marked over 40 localities where water power is believed to be available in amounts ranging from 400 up to 20,000 horsepower, and the list does not claim to be complete.

American Society for Testing Materials.

The sixth congress of the International Association for Testing Materials will be convened in New York City on September 2 to 7. The congress is to be held under the auspices of the American Society for Testing Materials.

E. L. Callahan.

While commercial or new-business departments are of comparatively recent origin as distinct and individual departments of central-station organizations, the remarkable development of this new field has exceeded all expectations. A most gratifying aspect of this development has been the policy, on the part of central-station owners and executives, of placing men of the highest type in charge of this new work—men who combine executive and engineering ability with aggressive and progressive commercial methods. This policy has, of course, been responsible for the development previously mentioned, as is convincingly demonstrated in the case of H. M. Byllesby & Company, Chicago, which in 1909 reorganized its new-business department and made E. L. Callahan manager. During the intervening years Mr. Callahan has assembled a force of business getters second to none and has planned and executed innumerable business-getting campaigns which have been sufficiently original to elicit favorable comment from the entire central-station field and resulted in greatly increased revenues for every one of the properties controlled by the Byllesby organization.

E. L. Callahan,
Manager New Business Department, H. M. Byllesby & Company.

Errett L. Callahan was born at Scio, N. Y., May 19, 1876. While a boy he passed several years on South Dakota and Kansas farms, returning east to Cleveland, Ohio, with his parents when 15 years old. He attended Hiram College at Hiram, Ohio, following an academic course. Determined to become an electrical engineer, he entered the Case School of Applied Science at Cleveland, specialized for four years, and was graduated in 1900 with the Bachelor of Science degree. Mr. Callahan worked his way through Case by designing and constructing laboratory apparatus in the electrical engineering department, operating the dynamos of the lighting plant, and in the machine shop employment, securing thereby much practical experience. During vacations he followed similar occupations.

In 1903 Mr. Callahan received the Electrical Engineer's degree from Case School, his thesis being upon a new method of electrical heating. Later he became an associate member of the American Institute of Electrical Engineers, member of the Organization Committee of the Commercial Section of the National Electric Light Association, chairman of the Sign Committee of the preceding organization, and member of the Membership Committee of the National Commercial Gas Association.

After leaving college Mr. Callahan received a commission as electrical expert in the signal service of the War Department, being assigned to the equipment with automatic telegraph instruments, of a proposed submarine cable from Nome to St. Michaels, Alaska. Returning from this expedition he was engaged for two years in the experimental laboratories of the Crehore-Squier Intelligence Transmission Company, at Tarrytown, N. Y., later joining the forces of the Postal Telegraph Company, carrying on experiments with automatic telegraphy between New York and Chicago.

Early in 1902 he entered the service of Westinghouse, Church, Kerr & Company, assisting in laying out the electrical distribution system of the shops and power house of the American Car & Foundry Company at Burwick, Pa.; also assisting in some of the early work for the electrification of the Pennsylvania Railroad's New York terminals.

For a long time Mr. Callahan had been interested in the possibilities of electricity for heating, and he made his advent into this field late in 1902 as assistant manager for the Simplex Electric Heating Company, of Boston. Three years afterward he went to New York City as assistant engineer of the Prometheus Electric Company, later becoming manager.

His experience in electric heating caused him to be employed by the General Electric Company in 1906 as manager of the Heating Department of the Chicago District office of that organization. In this capacity he was called upon frequently for consultation in the design and construction of devices. The electric-heating business had not yet been developed to any considerable extent, and no one realized this better than the manufacturers. Mr. Callahan was convinced that the manufacturers not only must originate heating appliances and sell them to the central stations, but should show the operating companies how to introduce and sell the devices to the public. Toward this end he organized a force of five men in his department, their work being to teach central stations how to popularize flatirons, toasters, water heaters and other electrical devices. This innovation succeeded remarkably well and was widely extended to other departments. By 1909 the force of salesmen-demonstrators working out of the Chicago office heating department had increased to fourteen.

In 1909 Mr. Arthur S. Huey, vice-president of H. M. Byllesby & Company, reorganized the commercial or business-getting departments of the various electric and gas companies operated by his firm, selecting Mr. Callahan for the task. Mr. Callahan undertook the work in May. Since that time the number of properties operated and managed by H. M. Byllesby & Company has more than doubled. The men employed in the New-Business Departments of the local properties now number close to 100.

As chairman of the Committee on Commercial Section Digest and Cost of Commercial Department Work of the Commercial Section, N. E. L. A., Mr. Callahan compiled and presented at the recent Seattle convention invaluable data on these two subjects, the former attracting wide attention as the most important and valuable report presented before central-station men.

The Growth of the Electric-Vehicle Industry.

According to certain data recently made public by the General Vehicle Company in a Boston address by President Wagoner, and contained in a recently compiled data book for central-station managers, says the *New York Times*, the electric vehicle industry is making some very remarkable forward strides just at present. According to Mr. Wagoner, there were sold in the one year ending last September 31 per cent of all the electric vehicles in use in America at that date, which were estimated at a value of $30,000,000 in pleasure cars and $10,000,000 in trucks.

Speaking of the rapid growth of late to install electrics, especially among those who have used them, Mr. Wagoner states that 70 per cent of the business done by manufacturers was on repeat orders. One group of 100 firms uses not less than 1,009 electric trucks, two express companies own 356 electrics, three brewers 172, three packers, 119, three contractors 93 and three central stations, 158. In detail as to the rate of movement by date of purchase, the following data are given of the purchases made by two companies, the first being an express company and the second a brewer.

Date.	Number.	Capacity.
1907	1	2-ton
1908	1	2,000-pound
1908	1	2-ton
1911	75	2-ton
1911	2	3½-ton
1912	20	2-ton
1912	6	3½-ton

Date.	Number.	Capacity.
1903	4	5-ton
1907	3	3½-ton
1911	39	5-ton
1911	4	2-ton
1911	2	1-ton
1912	15	5-ton
1912	2	3½-ton

Nor is all the credit for this rapid growth of users given by Mr. Wagoner to the newer development of vehicles. On the contrary, he has an idea that more credit is due the older vehicles than is generally accorded. "One has only to compare the relatively crude and inefficient models of ten years ago to realize what improvements have been made in electrics," says Mr. Wagoner. "It should be borne in mind that the phenomenal sales of the past two years have been brought about by the splendid performance of these same discredited early types. They were clumsy and gave a mileage that was discouraging, but so well were they designed and constructed for those times that they stood up under the brunt of from seven to ten years' hard service. It is the old veterans of 1902-06, runing side by side with the newer 1912 models, that convinces the business man of electric truck efficiency and reliability more than anything else. Today we have an electric truck which is better proportioned, more efficient and eminently more dependable than if earlier conditions had been more favorable in mileage and low maintenance cost. It is the tree which grows on the side of the mountain exposed to all the elements which develops the toughest fiber, and the early tribulations of the electric truck are responsible for its present splendid efficiency."

There appeared in these columns not long ago a statement that within a few weeks Peter Doelger, the brewer, of New York, meant to dispose of his last horses and run his business entirely on electric delivery. It appears that M. Groh's Sons, another brewery firm, has beaten him for the first honors. They have sold in all thirty-six horses, the last four being disposed of June 17. Six electric trucks are doing the work of the thirty-six horses displaced and much more, as the business has largely increased within the past year. Electric trucks are used exclusively and all six have been delivered since June 30, 1911. Peter Doelger has sold 169 horses since buying fifty-four electric trucks and has only five horses left. Who will be second on the honor roll? The first central station to discard all horses is the United Electric Light & Power Company, also of New York. This company uses twenty-two electrics and not a single horse owned or hired. The aggregate of electric trucks in use in cities is getting to be a matter of some importance to the central-power station. The data book referred to states that it is confidently expected that the increase in electric truck production during 1912 will exceed 1911 by from 350 per cent to 500 per cent, and as new manufacturers are rapidly entering the field, 1913 may even double this record. Without taking into consideration the rapid increase in the purchase of electric pleasure cars, the outlook for the sale of current is certainly bright. The central stations who have taken the initiative are already selling a lot of current at the "off-peak" rate. In fact several of them are climbing up toward the $100,000 mark.

Electrical vehicle dealers in New York are holding a series of weekly meetings, getting together every Wednesday at luncheon at some hotel. All sorts of subjects have been discussed at these meetings, but the one that is now causing the greatest concern is the advisability of holding speed contests, hill climbs and long distance runs, for the purpose of securing advertising material and data, as well as to attract popular attention to this type of automobile. Some dealers are opposed to the plan, arguing that it will hurt business. They say the electric is not a racing or a touring car; that it was designed simply as a town or suburban vehicle and that the minute it is put into competition it loses a great share of its individuality. These dealers favor suburban runs, such as the one held by the Electric Automobile Club last Saturday, in which fourteen cars started and finished the forty-five mile run. The next meeting of the electrical vehicle dealers will be held at Sherry's on Wednesday.

Western Union Pension System.

On July 1, 1912, the Western Union Telegraph Company will put in effect a provisional plan for pensioning its employees who have been in the service of the company for 20 years and have reached the age of 70. Employees who have not yet reached this age but have become permanently incapacitated for service may also be retired upon pension. No pension will be less than $25 per month and none will exceed $100. The amount of the compensation is based upon the average salary for the last 10 years.

The number of employees of the Western Union Telegraph Company is over 47,000.

Wireless Apparatus to Ring Bell Invented.

Signor Marconi has invented, since the *Titanic* disaster, a wireless apparatus to ring a bell, and thereby give warning that there is a ship in distress. This is accomplished by a sequence of waves lasting 15 to 30 seconds. Mr. Marconi says that tests have been successfully made and that he has every confidence that this invention can be employed.

Stimulating the Growth of Chickens.

At a farm at Great River, Long Island, N. Y., apparatus is being installed for subjecting young chickens to electric stimulation during their early growth. The proprietor, R. C. Lienau, is following the experiments made by Thorne Baker, of London, who showed that high-frequency electric stimulation resulted in very rapid growth.

Telegraph Records Broken.

The telegraph companies of Chicago, Ill., have stated that all previous daily records were broken on June 18, the opening date of the Republican national convention, when it is approximated that 1,000,000 words were transmitted.

Electric Signals Planned by Wabash.

The Wabash Railroad Company has announced that it will spend $1,250,000 in equipping more than 1,000 miles of its road with electrical block signals.

Central-Station Power for Grain Elevators.

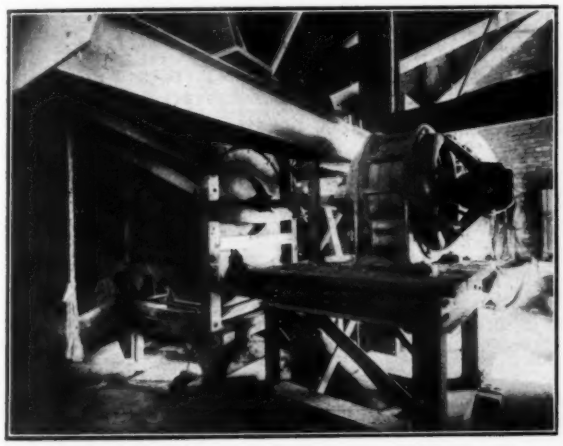
Although operating results indicate that grain elevators can effect a considerable saving in power by purchasing energy from central stations, the advantages of motor drive in this industry are of such importance as to be of secondary importance to the actual cost. Result obtained in numerous plants are presented in this article.

The field for the sale of central-station power to grain elevators is a large one and worthy of the most serious consideration on the part of central-station managers. In the small station gasoline competition will be found in numerous cases but even if the cost of energy exceeds the cost of gasoline, the many advantages of the motor will convince the most skeptical that motor drive is ultimately the most economical. This has been demonstrated in so many instances that remote location of an elevator from central-station systems can be the only logical excuse for continuing to use mechanical power.

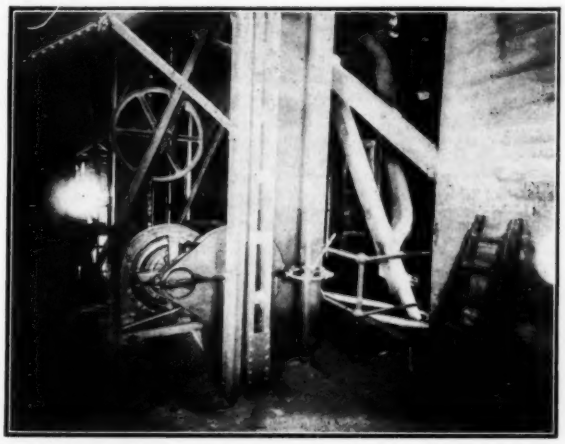
Before the advent of the electric motor, and especially the induction motor, it was the practive to drive the legs and conveyors in grain elevators by means of long lines of shafting or by rope or belt transmission, operated by reciprocating engines or other prime movers. Where these conditions existed, especially in elevators of large capacity having numerous legs and conveyors, it is evident that the friction lost in transmitting power to the various sections represented a large percentage of the total power required for operation, and that any reduction in the loss would directly affect the cost of handling the grain.

In the operation of grain elevators where constant speed is required, it will be found that induction motors have advantages that render them superior to any other form of drive.

It is evident that by using an individual motor either direct-connected, belted or provided with a relatively short rope drive for each elevator leg, conveyor, car puller or exhaust fan, the inevitable loss of friction resulting from long lines of shafting, or from long rope or belt connections, is to a large extent eliminated, and the total horsepower reduced to a minimum. This is due to the fact that the modern induction motor is an extremely simple device, requiring no expert attention, and one which when once started will operate continuously at approximately uniform speed. It is a very easy matter to convince the most skeptical purchaser that he is running no risk in placing the operation of the simple induction motor in the hands of practically inexperienced help.



Seventy-five-Horsepower Motor Direct-Connected to Large Oat Clipper.



Twenty-five-Horsepower Back-Geared Motor Driving Elevator Legs.

The matter of determining the amount of power required for driving grain elevators with induction motors, involves simple mathematical calculations, with the exception, of course, of determining the amount of power required to drive the various cleaning machines. These may be obtained with the assistance of data giving the necessary power requirements for machines used in up-to-date elevators.

The formula used in estimating power for driving belt conveyors carrying wheat is to allow 0.6 horsepower for each 100 feet of belt per thousand bushels of wheat. To this result should be added 15 per cent for friction losses. Addition should also be made for rise in belt, if any.

The formula used in estimating power for screw conveyors is to allow 1.5 horsepower per 100 feet of conveyance per 1,000 bushels conveyed per hour. To the result should be added 25 per cent for friction losses. The speed recommended for screw conveyors varies from 160 revolutions per minute to 225 revolutions per minute, according to the diameter and pitch.

Even under the most unfavorable conditions, however, this friction loss with motor drive would be far less than that which results from driving the various units from a single source of power through long lines of shafting, or by other mechanical means of power transmission.

The simplicity and relatively light weight of the polyphase induction motor render it unnecessary to provide special foundations for the sizes usually employed in grain elevators. In some instances, where motors are used to operate car pullers or conveyors, space economy may be an important factor, and the fact that the induction motor can be installed on the floor, wall or ceiling, should be taken in account when providing for the adoption of motor drive. The induction motor for this work not only reduces the friction loss, but largely curtails the expense involved in the first cost of shafting and belting, minimizing cost of maintenance, replacement and repairs, and effects a safety in operation not otherwise obtainable.

In erecting new elevators, the adoption of electric drive will frequently effect a reduction in the cost of building construction. Heavy line shafting, hangers, pulleys, etc., need not be provided where induction motors with short belt or rope connections are used; where the motor is direct-connected, this expense

is entirely eliminated, and in many cases this saving will amount to 5 per cent of the total cost of the building.

The only valid objection which has heretofore existed in the operation of elevator legs by induction motors, has been the liability of the leg to run backwards, due to the weight of the grain, when the power was shut off from the motor. This back legging, or forming of a "choke," is now rendered impossible by the use of an attachment which permits the motor to run only in one direction. The instant it is stopped a powerful friction clutch holds the leg stationary. In order that the elevator may start on full load, motors for driving this apparatus are generally provided with a friction clutch which is thrown in after the motor has attained full speed.

While theoretically the best method of operating grain-handling machinery is to use individual motors throughout, the practice in most of the grain elevators which have adopted electric drives has been to combine the individual and group systems. Induction motors are ordinarily supplied for each elevator leg, car puller and exhaust fan, while the cleaning machinery, consisting of separator, screw conveyor, dust collectors, etc., is generally driven in groups by single motors.

If an elevator contains several groups of machinery it will usually be found advisable to install a separate motor for each group, and where additions are made, the new machinery can be set up and connected to its own motor, without in any way interefering with the operation of the original equipment.

It might be well to state here that the nominal capacity of a grain elevator as usually applied, gives no basis for figuring the amount of power required, for the reason that elevators are figured according to their storage capacity; for instance, either 50,000 bushels, 100,000 bushels, 200,000 bushels, 500,000 bushels, etc. The capacity as applied means simply the storage capacity, not the amount of grain which can be handled in a given period. In order to determine the amount of power required in a given elevator, the operation of the elevator must be carefully analyzed. It must be ascertained just what amount of cleaning is to be done. Possibly the elevator may be only a transfer elevator, where the grain is transferred from cars to boats, or from one line of railroad to another. Data are available on the operation of several large elevators. One, the Trans-Mississippi elevator at Omaha, Neb., having a total in motors installed, of 427 horsepower, was found to show an average number of bushels handled per kilowatt-hour during the months of May, June, July, August and September, amounting to 58.2 bushels. This covered the various kinds of grain handled and included corn, wheat, oats and rye.

In the Crowell Lumber & Grain Company, Omaha, the number of bushels of grain handled during the months of August, September and October, 1907, was as follows:

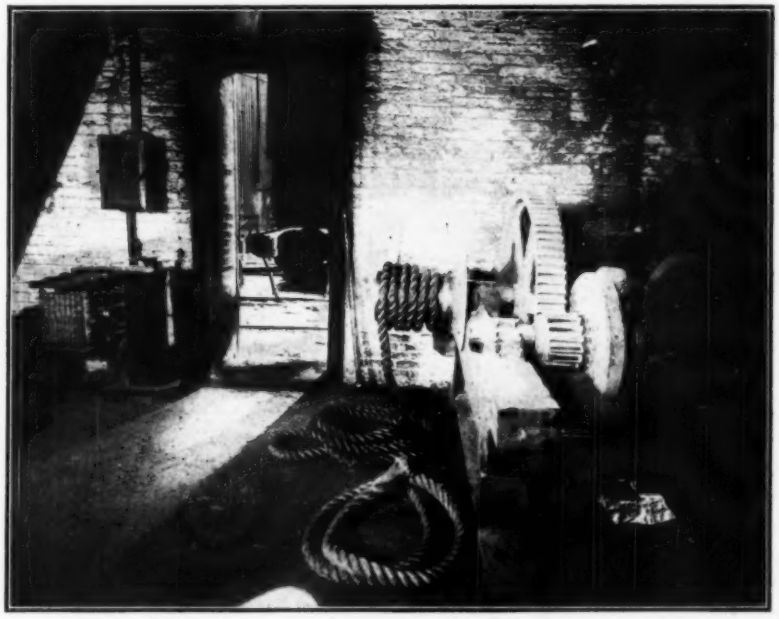
62.4 bushels of corn per kilowatt-hour
117.6 bushels of oats per kilowatt-hour
63.35 bushels of wheat per kilowatt-hour
Average = 81.1 bushels of grain per kilowatt-hour.

During September, same year:
104.5 bushels of corn per kilowatt-hour
195 bushels of oats per kilowatt-hour
97.6 bushels of wheat per kilowatt-hour
Average = 132.4 bushels of grain per kilowatt-hour.

During October, the amounts were:
30.66 bushels of corn per kilowatt-hour
60.39 bushels of oats per kilowatt-hour
30.27 bushels of wheat per kilowatt-hour
Average = 40.4 bushels of grain per kilowatt-hour.

Two 35-Horsepower Back-Geared Motors Driving Elevator Legs.

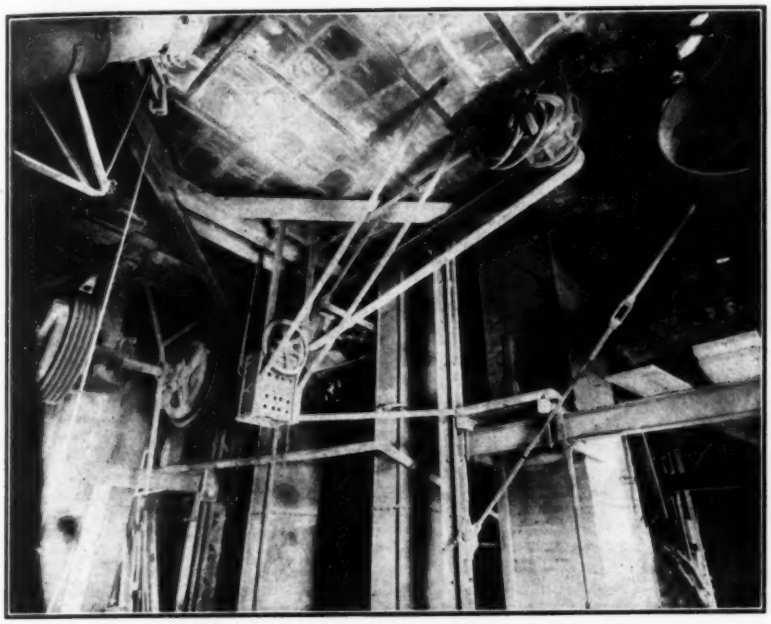
From the above data it will be seen that it is rather hard to obtain any figure from one elevator which can be used in another elevator. The cost per bushel for handling grain of various kinds is bound to vary. Each case must, therefore, be taken separately and all estimates worked out from data which is available on plants of approximately the



Mechanism of Motor-Driven Car Puller. Mueller & Young Elevator.

same size, and doing their work in a way as nearly the same as can be found.

An interesting installation of motors in a grain elevator which illustrates the many conveniences of this method of operation is in the plant of the Boston & Albany Railroad, at Boston. This plant consists of a grain elevator, grain-drying house, dust house and four conveyor systems. The grain elevator has a capacity somewhat in excess of 1,000,000 bushels. The general arrangement of the elevator and the machinery equipment, while representing the most modern practice and embodying the latest improvements, is very similar to that found in other elevators, designed and built for this particular class of service.



Eleven-Horsepower Motor Belted to Elevator Mechanism.

The wharf conveyor system consists of a number of overhead galleries, with towers at the various connecting points, inclosing belt conveyors which carry the grain from the elevator, and distribute it to convenient localities over the various wharf buildings, where by means of suitable loading spouts it is conducted to the hatches of the vessels loading at the wharf. Within, and for the full length of the elevator, there is a shipping conveyor gallery, which is connected by two inclined galleries bridging the yard to the main trunk of the distributing system. The main trunk gallery is located over the driveway which faces the water front, and from this main trunk two wharf galleries branch off at right angles over each of the wharf buildings.

Motor-Operated Car Unloader at Mueller & Young Elevator.

These wharf galleries extend practically the full length of the wharf buildings and afford some 50 loading points, at each of which an adjustable wharf-loading spout is provided. The aggregate length of all the galleries is somewhat over 6,000 feet. The main trunk and each of the connecting galleries contain two 36-inch belt conveyors. Each of the wharf galleries contains one 36-inch belt conveyor. The motors and machinery required to drive the belt conveyors are located in the various towers, which also contain a distributing valve and spout for diverting the grain from one belt to another. It is possible to so arrange the operation of the belt conveyors and distributing spouts, that grain may be delivered to four vessels at one time, furnishing 10,000 bushels per hour to each. The distance from the elevator to the motor in the furthermost tower is approximately 1,200 feet and there are five motors in the intermediate tower. It is no exaggeration to say that the development of this remarkable and extensive wharf conveyor system is rendered possible only by the use of electric motor drive.

With but slight exception, the individual motor drive has been applied to all of the machinery throughout this plant; and the most casual observer cannot fail to notice the simplicity of the power-transmission arrangement, and the freedom afforded the machinery, etc., by the absence of line shafting, belting and other equipment incidental to the mechanical drive.

The use of an individual motor drive under the low load-factor conditions existing in grain-elevator service demands, if the installation is to be successful from a commercial standpoint, that motors of relatively small rated capacity be used, and that full advantage be taken of whatever inherent capacity for overloads the motors possess. The characteristics of the induction motor make this type of motor almost an ideal one for this service, especially where, as in this case, the load can be applied through the medium of friction clutches. Full advantage has been taken of these characteristics in the selection of the sizes of the motors used in this installation; and it is probable that the motor equipment installed in this plant has the smallest rated capacity, in proportion to the capacity of the grain-handling machin-

ery, of any comparative plant now in existence.

A feature of design almost peculiar to grain elevators is the necessity for providing the means of supplying and distributing a large amount of power over a large floor area some 175 feet or so above the ground. The total amount of power available for distributing on the top floor of this elevator, based on the motor rating, is 1,045 horsepower. The aggregate rated capacity of the motors installed throughout the plant is 2,215 horsepower. The motors are all of the squirrel-cage type, wound for three-phase, 60 cycles, 440 volts.

Undoubtedly the most interesting feature of this electrical installation is the method employed for the operation of the motors. The necessity for providing for the remote control of many of the motors, together with other conditions of grain-elevator operation, required to be met by the electrical equipment, renders desirable the locating of all of the switching arrangement at one point and the placing of the same under the control of an attendant trained for the work.

The necessary operations required for motor starting are performed solely by this attendant, while the stopping of the motors can be effected by pressing a number of push-buttons which are conveniently located throughout the plant, and are connected to independently excited trip coils attached to corresponding switches. Each motor has an independent set of feeders and a separate control switch. The motor control switches, which are of the double-throw type, are connected to the two sets of busbars so that the starting and running potentials may be applied to the motors in turn. The switches are non-locking on the starting side, and are arranged so that only one side can be closed at a time. Each switch is provided with two series overload trip coils, and one of the remote-control trip coils previously referred to. Signals indicating to the switchboard attendant which motors are required to be put into service, are transmitted by means of a push-button and annunciator signal system.

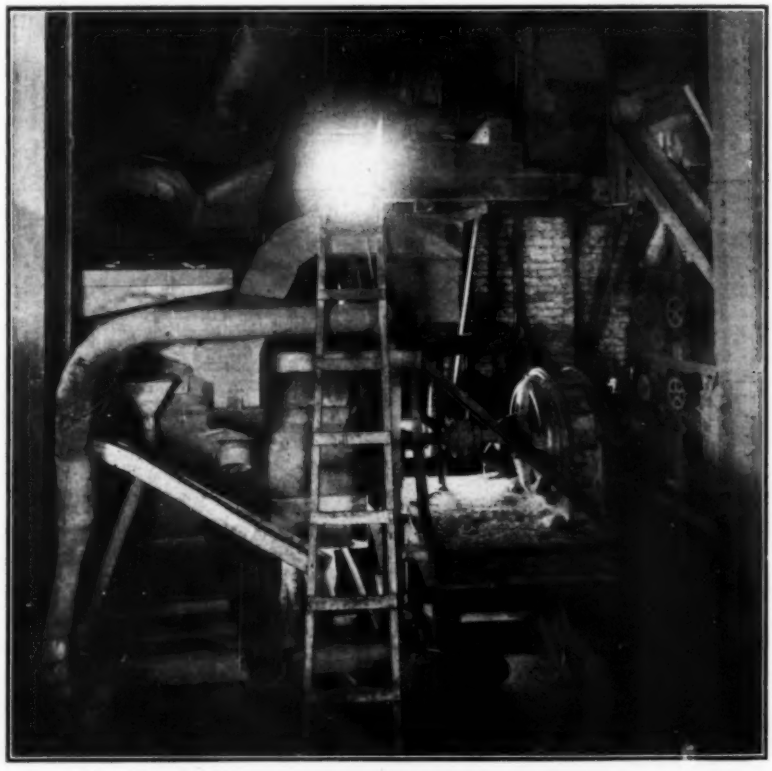
The decrease of the starting current with the increase of the speed of the motor is taken advantage of to furnish a means of indicating to the operator when to make the transfer from the starting side to the running side of the switch. Each motor circuit is provided with an ammeter having the scale graduated proportionally to the load reading. To admit of these meters being used as starting-current indicators four-pole switches and an ammeter arrangement, which is in service only when the switch is on the starting side, was employed.

The table gives a complete list of the motors installed in this plant.

No. of Motors.	Horsepower.	Synchronous Speed. Revolutions per minute.	Service.	Speed of driven shaft revolutions per minute.	Transmission.
1	100	720	Dust fans—double, 80-inch	700	Belt
1	75	720	Dust fans—double, 70-inch	700	Belt
6	55	514	Six receiving elevators—185-foot centers, 7x7x 20-inch buckets	29	Gear and rope
6	55	514	Six shipping elevators—190-foot centers, 7x7x 20-inch buckets	29	Gear and rope
5	53	514	Five cleaner elevators—181-foot centers, 7x7x 20-inch buckets	29	Gear and rope
1	36	900	Two dryer elevators—181-foot centers, 7x7x 12-inch buckets	32	Gear and rope
1	35	600	Six pairs Clark car shovels	66	Gear and rope
1	35	900	Two double drum car pullers	16	Gear and rope
1	20	1,200	One 36-inch transformer belt conveyor, 253-foot centers	146	Gear and rope
5	20	1,200	Five double cleaning machines	575	Belt
5	15	1,200	Five single cleaning machines	575	Belt
1	10	1,200	Passenger elevator—direct connected		Worm Gear
1	75	720	Three dryer fans—double, 90-inch	384	Rope and gear
			One 24-inch dryer belt conveyor, 75-foot centers	193	Rope
1	5	1,200	Dust packer	150	Belt
			Dust agitator	160	Belt
1	100	720	One 36-inch belt conveyor, 619-foot centers	117	Gear and rope
			One 36-inch belt conveyor, 387-foot centers	147	Gear and rope
1	100	720	One 36-inch belt conveyor, 754-foot centers	117	Gear and rope
			One 36-inch belt conveyor, 203-foot centers	196	Gear and rope
1	100	720	One 36-inch belt conveyor, 564-foot centers	117	Gear and rope
			One 36-inch belt conveyor, 184-foot centers	196	Gear and rope
			One 36-inch belt conveyor, 180-foot centers	196	Gear and rope
1	75	720	One 36-inch belt conveyor, 496-foot centers	147	Gear and rope
			One 36-inch belt conveyor, 283-foot centers	196	Gear and rope
			One 36-inch belt conveyor, 207-foot centers	196	Gear and rope
1	75	720	One 36-inch belt conveyor, 614-foot centers	117	Gear and rope
			One 36-inch belt conveyor, 233-foot centers	198	Gear and rope
1	75	720	One 36-inch belt conveyor, 229-foot centers	144	Gear and rope
			One 36-inch belt conveyor, 224-foot centers	144	Gear and rope
			One 36-inch belt conveyor, 99-foot centeds	196	Gear and rope
1	75	720	One 36-inch belt conveyor, 229-foot centers	144	Gear and rope
			One 36-inch belt conveyor, 224-foot centers	144	Gear and rope
			One 36-inch belt conveyor, 99-foot centers	196	Gear and rope
2	50	900	Two 36-inch belt conveyors, 740-foot centers	116	Gear and rope
1	15	1,200	One 36-inch belt conveyor, 193-foot centers	192	Gear and rope

The illustrations accompanying this article were taken in the plant of the Mueller & Young Grain Company, Chicago, which purchases energy from the Commonwealth Edison Company. Barley and oats are the two grains chiefly handled at this plant.

Complete power data on this and five additional installations are given in the accompanying data sheets.



Motor Driving Cleaner at Mueller & Young Elevator.

Grain-Elevator Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

This elevator is operated in connection with a 1,000-barrel flour mill and has a storage capacity of 105,000 bushels. Combination drive. Running hours per week, 60.

Total connected horsepower, 102.5. Motors installed, 9. Average kilowatt-hours per month, 3,328.

Kilowatt-hour consumption for 8 months: January, 4,300; February, 4,740; March, 2,840; April, 1,420; May, 4,100; June, 2,910; July, 1,830; August, 4,490.

Load-factor, 5.9 per cent; operating-time load-factor, 16.2 per cent.

MOTOR INSTALLATION.

The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	30	850	Back geared and belted to an 18-foot shaft (four hangers) and 12 feet of counter-shafting (four hangers) driving one 18-inch by 6-inch bucket elevator, 75-foot lift and one 11-inch by 5-inch bucket elevator, 75-foot lift.
1	7.5	1,120	Double extended shaft belted to two 24-inch by 10-inch fans, 1,100 revolutions per minute, made by Milwaukee Dust Collector Manufacturing Company.
1	7.5	1,120	Back geared and belted to a two-hanger shaft driving one 10-inch by 60-foot bucket elevator.
1	20	1,120	Belted to a two-hanger shaft driving one 16-inch by 85-foot distributing screw conveyor, 200 revolutions per minute; and one 12-inch by 85-foot distributing screw conveyor, 200 revolutions per minute.
1	7.5	1,120	Belted drect to a Prinz improved grader and separator.
1	5	1,130	Belted to a 36-inch by 12-inch fan, operating 425 revolutions per minute.
1	10	1,120	Geared direct to an 18-inch by 80-foot screw conveyor, operating 160 revolutions per minute.
1	5	1,120	Back geared and belted to driving mechanism of an unloading shovel.
1	10	1,120	Geared direct to an 18-inch by 50-foot receiving conveyor.

Grain elevator, name withheld, having cleaning machinery installed but used for storage purposes only. The elevators handle 70,000 to 100,000 bushels of oats per day.

Total connected horsepower, 510, of which 220 horsepower is not used. Number of motors, 13. Average kilowatt-hours per month, 4,526.

Kilowatt-hour consumption for three months: March, 4,680; April, 4,120; May, 4,780.

Load-factor on 290 horsepower, 2.8 per cent.

The electrical energy consumption per 1,000 bushels of oats handled is 2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60-cycles, 440-volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	100	690	Motor can be direct geared to either drum of a winch with steel cable for moving grain cars. Capacity, 25 cars.
1	20	840	Belted to a 20-foot shaft (four hangers) and by rope drive to an 80-foot shaft (13 hangers) operating three shovels through a drum and cable. Grain is dumped from car door through a grating into a grain pit.
3	50	495	Each driving by ropes and shafting, the receiving and loading legs of a 24-inch by 100-foot grain elevator. Buckets 20 inches by 8 inches, spaced 12 inches apart.
1	20	840	Direct connected to a five-inch centrifugal fire pump.
4	40	495	Each direct connected to a Huntley "Monitor" No. 9 oat clipper.
2	20	840	Each belted to a Huntley "Monitor" No. 9 dustless separator, pulley 20 inches by 6 inches, 420 revolutions per minute.
1	20	840	Connected by rope drive to a 40-inch steel plate fan, 840 revolutions per minute.

The 100-horsepower motor is a slip-ring machine, the others being squirrel-cage motors.

Grain elevator, name withheld, operating in connection with a flour mill. During one month there were shelled and loaded 2,500 bushels of corn, 5,000 bushels of wheat were cleaned and elevated, 3,500 bushels of oats were handled and 300 bushels of clover seed cleaned. The power consumption was 540 kilowatt-hours.

Total connected horsepower, 32. Number of motors, 2. Average kilowatt-hours per month, 374.

Kilowatt-hour consumption for 10 months: February, 230; March, 300; April, 370; May, 570; June, 200; July, 430; August, 580; September, 240; October, 420; November, 400.

Load-factor, 2.1 per cent.

MOTOR INSTALLATION.

The following motors are two-phase, 60-cycle, 220-volt squirrel-cage induction machines.

No.	Horse-power.	Speed R. P. M.	Application.
1	30	1,120	Belted to a 20-foot (three hangers) shaft, 150 revolutions per minute and 127 feet of counter-shafting driving one Victor corn sheller, 300 bushels per hour; one 20-foot scraping chain conveyor; one No. 2 Cornwalls grain grader; one 12-inch by 70-foot bucket elevator; one 14-inch by 70-foot bucket elevator; one 14-inch by 40-foot bucket elevator; two 12-inch by 50-foot bucket elevators; and one No. 5 Moline dustless wheat separator.
1	2	1,700	Belted to a No. 16 "Clipper" clover-seed cleaner.

Grain-Elevator Data—Sheet No. 2.

Mueller & Young Grain Company, Chicago, Ill., Grain Elevator, Combination Drive.

Total connected horsepower, 753. Total number of motors installed, 38. Average kilowatt-hours per month, 48,038. Average kilowatt-hours per month per connected horsepower, 63.

Kilowatt-hour consumption for 12 months: January, 71,793; February, 46,843; March, 58,198; April, 43,848; May, 48,088; June, 41,710; July, 27,235; August, 28,028; September, 48,698; October, 60,228; November, 56,850; December, 44,938.

Average load-factor, 26.8 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60-cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
4	35	600	Back geared, running four large elevator legs.
2	25	600	Back geared, running two small elevator legs.
1	7.5	1,200	Back geared, running one barley bleacher.
1	5	1,200	Back geared, running one pony elevator leg.
1	10	900	Running one belt conveyor on sulphur floor.
1	10	900	Running one east conveyor on sulphur floor.
1	5	1,200	Running one fan on sulphur floor.
1	11	765	Running one elevator.
1	50	900	Running one barley scorer (old motor).
3	25	1,200	Running three large fans.
2	15	1,200	Running two twin separators.
1	15	1,200	Running one Northwest separator.
1	75	514	Running one large oat clipper.
1	50	514	Running one oat clipper.
1	35	900	Running one new oat clipper.
1	1.5	1,200	Back geared, running one mustard cleaner.
1	37.5	540	Operating two car pullers.
2	5	1,200	Running two conveyors from track in basement.
2	10	900	Running two large conveyors in basement.
1	15	1,200	Running one car-unloading shaft, back geared.
1	7.5	1,200	Back geared, running screw conveyor and dust packer.
1	0.5	1,200	Running one sulphur burner reel.
1	3	1,200	Running one circular saw.
1	2	1,200	Running one sack elevator.
1	5	3,350	Running one centrifugal pump.
1	15	1,200	Running one oat cleaner.
1	10	1,200	Running one cleaner.
1	17.5	....	Running one screenings cleaner.
1	50	900	Running elevator.

Energy is supplied by the Commonwealth Edison Company, Chicago.

Shaw-Garner Company, Louisiana, Mo. Grain elevator. A gasoline engine was formerly used in this plant. Comparative costs show electric power slightly increased over gasoline costs, but electric power is preferred on account of convenience, readiness to serve and uniform regulation.

Total connected horsepower, 20. Number of motors, 1. Average kilowatt-hours per month, 365.

Kilowatt-hour consumption for 12 months: June, 480; July, 740; August, 350; September, 260; October, 220; November, 360; December, 420; January, 190; February, 300; March, 200; April, 330; May, 530.

Load-factor, 3.3 per cent.

MOTOR INSTALLATION.

The following motor is a three-phase, 60-cycle, 220-volt squirrel-cage induction machine.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	685	Belted to a line shaft to which is connected one Bowser corn crusher, one set of meal burrs and small elevator.

Energy is supplied by Louisiana Light, Power & Traction Company.

Central Milling Company, Muskogee, Okla. Grain elevator. Combination drive. Running hours per week, 140.

Total connected horsepower, 135. Number of motors, 4. Average kilowatt-hours per month, 18,660.

Kilowatt-hour consumption for 12 months: June, 17,700; July, 16,080; August, 16,980; September, 16,200; October, 11,820; November, 24,420; December, 22,680; January, 28,620; February, 18, 540; March, 10,740; April, 23,460; May, 16,680.

Load-factor, 25.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60-cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,800	Belted to a line shaft driving one screw conveyor; three feed mixers; one 30-inch exhaust fan; and one power shovel.
1	25	1,800	Belted to a line shaft driving one 5-inch by 14-inch elevator leg; two 4-inch by 12-inch elevator legs; one 7-inch by 18-inch elevator leg; and one Cornwall rotary screen.
1	30	1,200	Belted to a line shaft driving one 9-inch by 30-inch single-stand rolls; one 1,000-bushel-per-hour Victor corn sheller; one drop-gear bran packer; and one 20-inch by 22-foot belt conveyor.
1	75	1,800	Direct-connected to one Williams No. 0 grinder.

Energy is supplied by the Muskogee Gas & Electric Company.

Commercial Practice
Management, Rates, New Business

NOTES ON THE ECONOMICAL OPERATION OF SMALL CENTRAL STATIONS.[1]

By H. H. Stephens.[2]

The economical operation of a small central station I conceive to be that operation or management that permits of the highest legitimate return to the sockholder consistent with the best possible service to the public, and the maintenance of the physical property of the central station in the highest state of efficiency, without which neither a satisfactory return can be made to the investor, nor good, reliable, continuous service furnished to the public.

The small central station can be fairly termed, at least for the purpose of these remarks, one serving a population of less than 8,000, and a maximum capacity of 1,000 horsepower. Central stations of this size are generally equipped with return-tubular boilers and simple non-condensing Corliss or high-speed engines. (In plants of this size and type, the manager is of necessity in close personal touch with all departments and his duties are more varied, and I sometimes think more difficult, than those of the manager of larger properties, whose duties are principally the general supervision of a trained corps of department heads, whereas the manager of a small central station must very often be his own mechanical, electrical and operating engineer.)

The small central station, whose business it is to produce light and power, should be a better equipped, better kept, more efficient one than that of the factory or mill owner, whose principal thought is given to the perfection of his article of manufacture and whose power plant is considered merely a necessary evil, or a means of driving his machinery and appliances; but, only too often we find the reverse to be true.

The first essential for securing economy in the operation of the central station is the co-operation and loyalty of the working force. They should be well paid—better than employees in like service in other lines—and the fact should be impressed upon them that they are paid more, because their responsibilities are greater and more is expected of them than of the fireman or engineer of a factory or mill. The working conditions and surroundings should be as pleasant as possible—lockers for clothes, shower bath and rest rooms for men when they go off duty, well kept grounds, clean buildings—all of these can be had at little expense and add greatly to the efficiency and the pride of the men in their work.

It is usual in calling attention to economies that may be practised at the power plant, to begin with the coal pile, and it is here, undoubtedly, that the largest single item of waste can be found, or saving made. Coal should be stored in bins and as convenient to the boiler room as possible, to reduce cost of handling and to eliminate all unnecessary or useless labor between the coal pile and furnace. The common practice, in small stations, of throwing coal on the ground, exposed to the sun and wind from all sides, is a most wasteful one; the loss of such coal in steaming or heating value can be reduced one-half by the use of suitable and inexpensive coal bins.

The ordinary small station wastes from 15 to 20 per cent of its fuel by careless firing, from air leaks around boilers and through boiler settings, etc. These leaks in return-tubular boilers will usually be found around doors of combustion chambers, blow-off pipes, arches at rear of boilers and cracks in the brick work. These can be kept closed by constant watchfulness, but it would generally be economy to cover the boiler settings with steel, or some of the asbestos-type coverings now made for this purpose.

The fireman must be taught the proper thickness of fuel to carry on his grates; the importance of keeping the fuel bed even and free from thin places and blow holes, so that combustion will be continuous over the entire grate surface. He must be shown that just a certain amount of draft is necessary to consume this fuel at the highest efficiency, and to control his air supply by manipulating his stack dampers, or ash-pit doors.

The proper thickness of fuel bed and amount of draft required, at this most efficient point, can only be determined by careful experiment, unless you have draft gauges, instruments for taking stack temperature, making flue-gas analysis, etc., all of which can now be had at a very reasonable cost, and should form part of the equipment of every central station. A recording pressure gauge is also a valuable instrument, as it is a continuous reminder to the fireman to maintain constant steam pressure, which is conducive to economy of fuel. A poor fireman is dear at any price and our experience is that it pays to secure men of good average intelligence for this position, paying them good wages and giving them to understand that they are always in line for promotion to the position of assistant and chief engineer.

Boilers must be kept clean and free from scale and accumulation of soot and ash on shell and tubes. All live steam pipes should be covered with mineral wool, or other approved type of covering, as without this protection the loss from condensation results in a marked loss of economy. Exhaust from pumps where steam-driven should be utilized to heat the feed water, and the use of open heaters of sufficient capacity for this purpose will give a temperature of 200 to 210 degrees to the boiler feed water, causing the precipitation of a considerable portion of the scale-forming properties of the water, in the heater, besides saving from 12 to 15 per cent of fuel used, and at no extra cost for operation.

With the ordinary Corliss engine with valves propertly set, probably but little saving can be effected, but in the matter of lubrication, an appreciable saving can be made by using an engine oil of good quality in connection with an automatic oiling and oil-filtering system. Such a system is inexpensive and will save from 35 to 50 per cent in the cost of engine oil needed for perfect lubrication, as compared with hand oiling, as well as giving the engineer or engineer's helper more time for keeping his engine room and machinery in a clean and attractive condition. A possible further saving can be made in many cases, by experimenting until the proper cylinder oil is found for the working conditions of the engine.

A machine shop, containing hand tools, a small forge, lathe, power drill press and emery grinders will be a

1 Paper presented at annual convention of Oklahoma Gas, Electric and Street Railway Association.

2 Manager of the El Reno Gas & Electric Company.

means of economy, as your operating engineer or assistant can usually make the small repairs needed and generally prefers doing it, to taking the work to a machine shop and awaiting the pleasure of the repair man for its completion and return.

There are usually great opportunities for improvement in the distribution system of the small central station. I have in mind a situation where a rearrangement of lines and transformers resulted in the reduction of distribution losses from 35 to less than 15 per cent. When this work was completed, we had material enough on hand—poles, transformers and wire—to install another system capable of serving half as large a territory.

Judgment should be used in running feeder lines to the centers of distribution and in properly locating transformers to take care of districts, rather than to use excessively small units in the block system, as is often practiced, because with the larger transformers that can be used, regulation will generally be better and core losses will be greatly reduced.

Numerous other economies might be noted, that the scope of this paper will not permit of going into in detail, each item of saving, perhaps small in itself, but in the aggregate spelling the difference between success and failure to many small light and power companies.

Briefly, the greatest economy in the operation of the small central station can only be attained by constant attention to the little details of saving and repair and improvement, that can be noted day after day by the fireman, the engineer, the superintendent, the office force, and the manager, all working together.

Central Station Participates in Knights Templar Celebration.

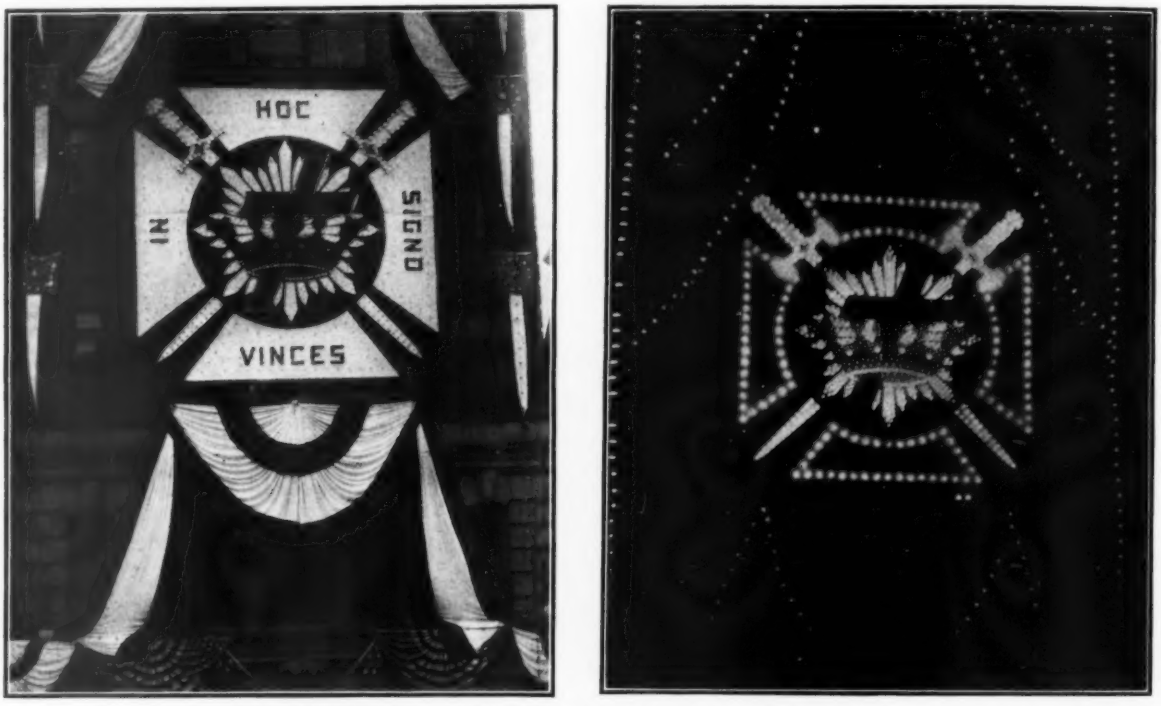
During the conclave of the Pennsylvania Knights Templar in Pittsburgh on May 27, 28 and 29, the Allegheny County Light Company "spread itself" in the matter of electrical decorating, its display easily being one of the most notable in the city in honor of the Knights.

The central figure of the company's display, which took up the entire front of its seven-story office building on Sixth Avenue, was a huge Maltese cross, containing the cross and crown of the order in the center. Behind the cross and crown, which was in colored lights, was a great white sunburst. The sunburst began lighting from the center and gradually crept out towards the ends, the effect being a most pleasing one.

About 400 16-candlepower lamps were used in the central decoration, and about 1,600 lamps on the front of the building. The officials of this company estimate that in the entire city, during the conclave, there were 250,000 lamps used in honor of the knights, representing about 5,000,000 candlepower. This is in addition to the regular lighting, with which the city is richly blessed.

Repair of Electric Signs.

In the past it has not been the policy of the New York Edison Company to lamp electric signs which were the property of the customer. This applied as well to installment signs which had been paid for in full, and turned over to the customer, a practice which led to considerable complaint and the unsatisfactory appearance of the signs. In order to eliminate this difficulty a committee was appointed to look into the matter and make a report. It has, as a result, been decided that the Arc Light Department will now inspect and maintain, free of charge to the customer, all small electric signs on the front of buildings. This applies to retail customers only. Small repairs, such as the replacing of fuses, splicing broken wires where accessible, replacing burnt-out lamps, and so forth, will be included in the maintenance. It is understood that the company will furnish as usual the standard types of lamps as carried in stock.



Day and Night Views of Spectacular Temporary Electric Sign in Pittsburgh.

Free Ice from a Central-Station

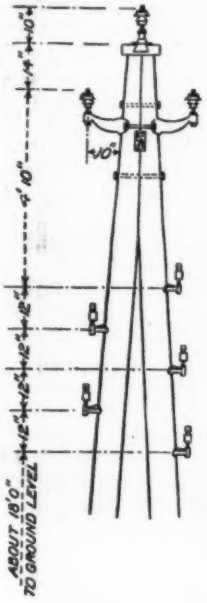
The Lexington, Ky., Utilities Company, which operates several electric properties in that city, including a lighting plant, street-railway system and interurban lines, has joined with the Salvation Army in an attempt to relieve as much suffering on account of heat as possible. The company operates an ice factory in connection with its power plant, and has agreed to give 1,000 pounds of ice daily to the organization, this including delivery to homes where needed.

Electrical Construction

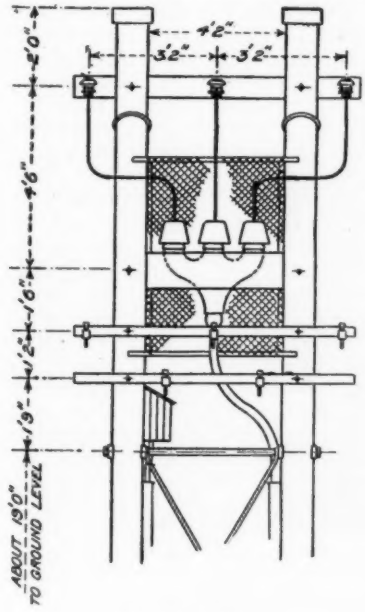
OVERHEAD TRANSMISSION CONSTRUCTION IN THE CLYDE VALLEY.

By Albert H. Bridge.

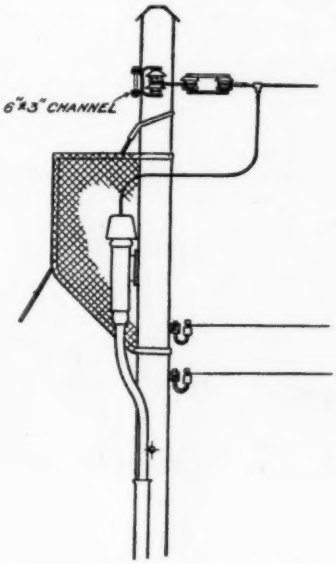
British engineers have always been more or less at a disadvantage so far as the United Kingdom is concerned in respect to overhead transmission line work. Today there is far less prejudice or restriction than was the case several years ago, but the limitation of enterprise is inevitably accompanied or followed by a lessening of the exercise of the inventive faculty.



Standard "A" Pole.



Terminal Pole.



Another View of Terminal Pole.

It has frequently been complained that the lack of water power in the British Isles has occasioned a lack of experience in hydroelectric work which has to some extent hampered British manufacturing and contracting firms in this department of effort; and in the matter of high-tension overhead transmission-line work want of opportunity has been regretted. The carrying out of the power schemes for supplying electricity in the great industrial districts, however, has, with a gratifying larger breadth of mind on the part of the Board of Trade, enabled some very interesting work to be done. An example is to be found in the area of the Clyde Power Company. At the present time there are 96 route miles of underground cable and 21 miles of overhead lines, all operating at 11,000 volts, with 84 substations and six switch houses.

The main extra high-tension work is laid out on the ring-main system. The longest ring is upwards of 30 miles in route length. The conductors in cables used in the extra-high-tension main circuits are three-core, 0.15 square inches, constructed for operation with generators having the neutral point of the star-connected armature winding grounded. Paper insulation is used throughout. In the case of small power supplies, where the revenue to be derived from the load is not sufficient to justify the expense of looping in the main ring cables or the cost of erecting a switch-house, special 11,000-volt street-disconnecting boxes are used. These are of special design, the distinctive feature being that each phase is brought into a separate porcelain cell to permit of the disconnecting link being oil-immersed. Some of these have been in use satisfactorily for four years. In regard to the extra-high-tension overhead lines, these are employed in sparsely populated districts. These serve a very useful purpose in development work, for isolated works are thus secured as customers which otherwise would have to be passed over on account of the revenue not being sufficient to meet the heavy cost of underground mains.

David A. Starr in giving an account of the whole system of the Clyde Valley Company before Glasgow electrical engineers, remarked upon the frequent amendment in design of these lines that has had to be effected to meet extraordinary conditions, and to remedy defects which from time to time developed in practical operation. On some lines the trouble experienced from birds was of a most serious nature, grounds and short-circuits being of frequent occurrence, and, in consequence, the development of overhead construction was arrested until an efficient remedy was found. The bird trouble was confined principally to terminal poles or poles where shackle insulators are used, and the difficulties were finally surmounted by placing three shackle insulators in tandem.

An accompanying illustration shows the general design of pole—a creosoted "A" pole having malleable cast bracket arms. The main conductors are set 30 inches apart, with the telephone and relay conductors carried underneath. The insulators are of the two-part design. Single-part insulators were first

tried, but these had to be discarded on account of unequal expansion and contraction during hot weather. Where highways had to be crossed with extra-high-tension lines, a pole was erected on each side of the road, and the wires were protected by a grounded cage in acordance with the Board of Trade model description then in force. Mr. Starr says that although these cages were of ample size, and made of the strongest possible material, much trouble was experienced during heavy windstorms by the cages swinging and making contact with the conductors. During the past year, however, the Board of Trade has been induced to alter its specification, and now a double conductor is strung across the highways on separate insulators close together, and the two conductors are firmly clamped together at intervals of about three to four feet, so that in the event of a conductor breaking, the strain is taken up by the remaining one. This system of road crossing has now been adopted by the Clyde Valley Company and the cages are being gradually replaced.

The Merz-Price balanced protective gear is used. The pilot wires for these are laid alongside the main cables in the case of underground work, whilst for overhead work they are carried as separate conductors on the pole line. The relays used are adjusted to operate on a fault current of 60 amperes, and by this means an ample margin of safety is left to allow of one or two branches being tapped off each protected section. Originally each section of overhead line was provided with lightning arresters at points where the overhead line joins underground cables. It was found, however, that these arresters disturbed the balanced protective gear whenever the atmosphere became electrically charged. Trouble was so great that they had to be discarded, dependence being entirely placed upon the lightning arresters installed on the substation bus-bars. Mr. Starr says that although there have been many severe thunder storms since this change was made, there has been complete immunity from accident or interruption.

Protecting Electric Fixtures From Flies.

The effect produced by flies on lighting fixtures in restaurants and similar places, in summer, is frequently quite unsightly and annoying. A good way to prevent this is to cover exposed parts of the fixtures with bronze foil tape. For a change, this is really artistic. When the foil is peeled off in the fall the fixtures will be found to have their original finish.

G. W. Barlow.

The Relations Between Contractors and Manufacturers.

Co-operation between electrical contractors and station engineers has been the subject of much thought, and it has not only been recognized generally that there is much to be said in its favor, but many schemes have been thought out and some have been elaborated with a view to bringing about so desirable a state of affairs. It is true that in certain localities there seems to exist a mutual antagonism between these two parties, which is most regrettable. It has been said that in many towns electrical contractors are prevented from carrying on their business in an independent and business-like way owing to the interference of station engineers and that it is a habit with some of the latter to tell a consumer the wholesale prices of lamp fittings, motors, etc., and to even go so far as to introduce the names of the actual makers. Such instances must surely be rare, and where they exist will be condemned by all station engineers who have the best interests of the industry at heart. In passing it may be said that it is probable that where strained relations do exist there is a certain amount of blame deserved by both sides, and that were the points in dispute to be looked at from a broader standpoint it is almost certain that a better state of things would be brought about.

But if co-operation between electrical contractors and station engineers is desirable, equally so is co-operation between contractors and electrical manufacturers and factors. The interests of the parties are identical. It is the aim of the manufacturer to find a market for his goods; it is the aim of the contractor to sell as many of those goods as he can and so make the profit which is necessary to enable him successfully to carry on his business. It has been held that it is not the duty of the manufacturer to call the attention of the public to the goods he has to sell, not his province to emphasize their good points nor to attempt to make evident their superiority to other goods of the same type. It has been felt that his duty was only to appeal to the contractor, and to persuade him to stock and push the appliances he manufactured. The shortsightedness of such a policy has long been apparent, and the contractor would be the first to admit that the firm of, say, lamp makers who did not advertise their goods to the general public as widely and effectively as possible would soon go out of business.

The contractor recognizes that the more energetically the manufacturer cries aloud the merits of his goods, the more eager the public are to buy them and the more business comes to the contractor. Attractive posters, showcards, booklets and pamphlets are produced by the manufacturer at considerable expense and distributed broadcast, and as a general thing any contractor who is working in the area covered may have an almost unlimited supply of this kind of advertising matter with his own name and address printed thereon. The distribution of such literature does good to both contractor and manufacturer and is one of the most useful forms of co-operation between the two parties.

Another form which has most beneficial results is the systematic supplying of goods on sale or return. The old method whereby a stock of more or less valuable fittings was loaned to a contractor for an almost indefinite time and eventually returned in a decrepit, tranished and fly-blown condition, did a great deal towards creating friction between the two parties to the transaction, the one holding the opinion that the goods were practically spoiled and the contractor should bear the whole or part of the cost of putting them into proper condition, and the other steadfastly maintaining that they were loaned so that he might try his luck with them and that if the manufacturer had wanted them back he should have sent for them earlier.

A systematic sale or return arrangement which could not fail to be productive of good results would be on the lines of the circulating library whereby a certain number of electrical appliances were loaned for a short period, such as a month or six weeks, to a certain number of contractors; and each contractor availing himself of the scheme undertook at the end of that time to pass the unsold goods on to another contractor whose name would be furnished by the manufacturer. Another supply of sale or return articles of different types and designs would then be forwarded on to the first contractor, who would, when the loan period came to an end, pass those unsold to the second contractor, who would pass his unsold stock on to a third, and so on. The arrangement would be of the nature of a round robin amongst the contractors participating. Each would receive a stock to commence with and articles sold would be at once replaced by the manufacturer.

A few years ago there existed a feeling in the trade that there was a tendency on the part of the manufacturers to ignore the contractor and the retailer, and to do business directly with the public. It is probable that this did not take place to anything like the extent that was imagined. It is safe to say that at the present time it is almost unknown. There is no doubt

that a difference of opinion will exist for some time to come between contractor and manufacturer as to who is and who is not entitled to trade terms, but with regard to this it must be admitted that both parties are perfectly honest in their opinions and where opposing opinions are honestly held there should not be much difficulty in arriving at an understanding.

It is some years since a manufacturer writing on this subject was forced to take for his text the unsatisfactory nature of the relations then existing between contractors and manufacturers generally. He stated that in examining into the cause for such a state of things he found that taking contractors as a class their status has been unsatisfactory. He said that a very large percentage of the fraternity were unsatisfactory customers, who possess neither technical nor commercial qualifications, who are exceedingly short of working capital, with little or no business methods. They are as a result difficult buyers and worse payers, and are, at the best, but indifferent electricians. Lest it be thought that this stricture was too severe it may be pointed out that in commenting upon this a leading electrical contractor went further and spoke of the financial instability of the average contractor, and stated that any man who severed himself from a position with a responsible firm and set up as an electrical contractor, probably without any financial backing, expected every advantage secured by firms who were well established and financially sound, including six months' credit, which, if he did not get he took. The writer went on to say that the manufacturer found himself in the hands of this undesirable element, and the good have had to suffer with the bad. He found that in leaving himself in the hands of a contractor of this class he was risking his reputation and incidentally his capital, and as a natural result he turned to the consumer. This originated with plant and apparatus of the nature of arc lamps, switchgear, etc., and it has grown naturally, nursed in particular by the ill-feeling which existed between the two bodies. He went on to point out that there is an essential difference between the supply of lamps to a shopkeeper or hotel, and the installation of a generating plant or the supply of such materials as cable to important self-installing customers such as large works or collieries who employ their own staff. In his opinion the contractor had persistently refused to recognise this essential difference, and he felt that whilst contractors persisted in the attitude that all electrical materials, no matter what their nature or purpose, must pass through their hands, and be either supplied or installed by him, it would be impossible for a good understanding to be arrived at between the parties.

Those statements may have been and probably were true at the time when they were written, but it is not certain that they would accurately describe the position today. The contractors' point of view is that the manufacturer and those who supply the trade should not deal with the public themselves but should confine themselves to trade business. All other trades do this; the grocer, the jeweller, and the furniture dealer, recognize that such a system of trading is only fair. If, on the other hand, the manufacturer holds the opinion that it is essential that he should deal with the public direct—and it is astonishing how few manufacturers or factors do hold such an opinion—he should do so on terms which would enable contractors to supply the same goods at a profit. At one time it was possible for any firm, no matter in what industry they were engaged, to go to an electrical manufacturer and buy plant at practically the same, or in some instances even a lower price than that at which the contractor could obtain the same goods. A buyer who has a large order to place can today obtain goods from certain firms at prices which are far below those shown in their catalogue, and it is only natural for contractors to feel that this is illegitimate trading. But it has been pointed out that the result of this competition on the part of manufacturers is that the contractor who desires to retain his customers has to bid against the manufacturer, and is forced in consequence to buy in a cheaper market, and so purchase low grade foreign goods rather than those of English manufacture. In every way the industry suffers by such competition. The manufacturer loses the business, the foreigner secures the order, and the consumer on whose premises the low grade material is installed has trouble eventually, and the contractor is blamed and loses reputation.

But today, it is generally conceded that self-installing customers may be supplied direct by manufacturers providing they had not been buying previously from a contractor. Manufacturers admit that it would be manifestly unfair, and further would be bad business, to cut out such a contractor. Certain classes of goods are bought by large contractors in great quantities, an arrangement being entered into by which the purchases are spread over a certain period. The terms are preferential, and to help him out with the sales he depends on some of his large customers to relieve him of part of his stock. If the manufacturer entered into competition with him by seeking himself to obtain the trade of the large customers, he would be left with a portion of his stock on his hands and would consequently suffer. But, as has been said, manufacturers recognize this, and the feeling which exists at the present time between the two bodies is such as promises well for the future of the industry.

Factors, or supply men have been mentioned as well as manufacturers, and it has been asked at times, by both manufacturers and contractors, whether factors, except those who sell goods of foreign manufacture which would be otherwise unobtainable, and which consequently do not compete seriously against home manufacturers, were really a necessary part of the electrical industry. It has been felt that it were better in every case for manufacturer and contractor to deal with each other direct and not through a middleman, and the necessary corollary to that is that the factor is not only unnecessary but is actually detrimental. A sufficient answer to that contention is that were it true the factor would have been driven out of business long ago by a stern and unalterable commercial and natural law which forbids the survival of the unwanted. The factor is an essential part of any industry. The man who bought in bulk and sold in small portions has always been a part of any business, whether it has had to do with a manufactured product such as cutlery or a natural product such as coal. The middleman fills just as important a part as do the contractor and the manufacturer, and if the wheels of business are to run smoothly there must exist good feeling between all parties. Each will find his proper place much more quickly through co-operation than through strife, and, as has been said, those engaged in the electrical industry, instead of having many offensive alliances with others and regarding each other with suspicion and thinly veiled hostility, should enter into one defensive alliance for their mutual benefit.—*The Electrical Manufacturer Installation Engineer* (London).

Commutator Lubrication.

I have found that the best way to lubricate a commutator is to boil the brushes in a good grade of cylinder oil. This will keep the brushes from chattering, and will properly lubricate the commutator and avoid collecting dirt. We have two rotary converters running at 900 revolutions per minute, the brushes on which we treat in this manner, and we have no trouble at all from the commutators.

We have an extra set of brushes which we keep soaking in oil until a change of brushes must be made. Then we boil them about 24 hours, and after wiping them dry, put them into service. J. B. LINKER.

SOME UNUSUAL CONSTRUCTION IN OPEN WIRING.

By H. G. Wilson.

While conduit is to be recommended wherever it is possible to use it, still open wiring is under certain rare conditions preferable. The following three deviations from what is usually found may be of interest and help to those who still have to contend with this class of work.

The first case was seen during a general overhauling and remodeling of a building, at which time the open wiring was being replaced with conduit work throughout. It was necessary to keep the circuits for power and light alive during the change over and owing to the public nature of the building the temporary wiring had to be as safe as possible. Fig. 1 shows the method used for branch-circuit wiring.

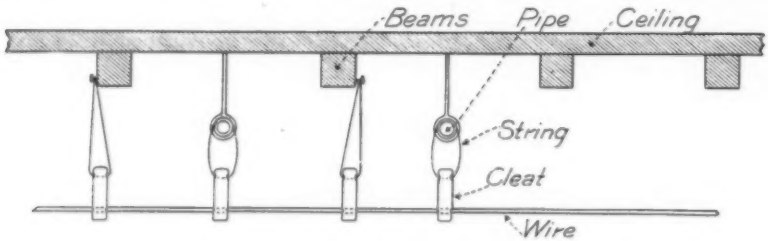


Fig. 1.—Temporary Suspension for Circuits.

Two-wire cleats were used and tied through one of the screw holes by means of string to pipes, beams and whatever else afforded support for them on the ceiling. They were spaced as closely to the 4.5-foot requirement as the supports permitted and the two wires of the circuit separated all the way from six to twelve inches, as convenience ruled. The No. 14 circuit wire was run through the remaining hole of the cleat and stretched as shown in Fig. 4. This provided a cheap and a much safer method than is usually found in temporary wiring.

In the case illustrated in Fig. 3 the ceiling was narrow and covered completly with layers of piping used for a variety of purposes. The lighting of the hall was previously accomplished by means of gas, so that when the building was wired for power and light, it was decided to wire all this place to "open."

Fig. 3 shows pieces of wood two inches thick thoroughly saturated with hot tar and shaped so as to fit closely around the lowest and central length of pipes. The lower half of the blocks were given as much depth as possible to allow room for the screws. Bolts held the two pieces securely together and, with the nuts drawn up tightly against washers, any movement along or around the pipe was prevented. No. 4.5 knobs were used for wire supports. The present condition of the circuits shows, after several years of use and abuse, that the construction has proved to be a satisfactory means of wiring for this particular place.

At the top floor of a building used for general merchandise, a space just under the skylight was used for an office. Light was necessary. Fig. 2 shows No. 6 galvanized-iron wire stretched tightly across this space, which is about 25 feet wide, and the ends fastened to screw-eyes on either side.

Three two-wire cleats were used as shown and fastened together by means of stove bolts and spaced 4.5 feet apart. Cleat rosettes were used to anchor the drops.

This instance shows that although it might be classed as a special case, still the Code was followed very closely, which might be done more often, if a little more thought were given to special cases along the line of making them as nearly standard as possible.

In crossing skylights, wood or other light-obstructing material is quite often out of the question, so that a wire support like the above is about the only really practical means that can be used.

This construction is stable and neat and excludes practically no daylight from the room below it.

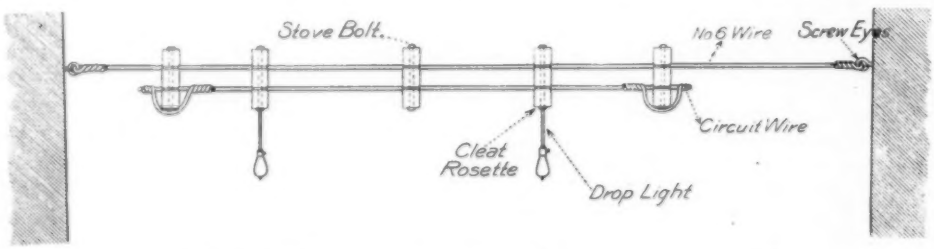


Fig. 2.—Support for Circuit Under Skylight.

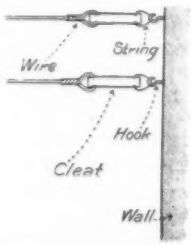


Fig. 4.—Showing Method of Fastening at Ends.

Pertinent Comments on the Electrical Contracting Business.

The following paragraphs are taken from the weekly report to the Faraday Electrical Association, of Chicago, by its secretary, W. J. Collins, on June 19. This association is easily one of the most progressive organizations of electrical contractors to be found anywhere, and its secretary is unusually well posted on conditions in the contracting field and constantly alert to current developments there. Toward the conclusion of this report Mr. Collins said:

"I wish to speak of a matter that impressed me very strongly at the Rock Island convention, which, though it has nothing to do with electrical contracting itself, I see no reason why the example shown therein could not be of benefit to our members. While taking in the town with one of the Rock Island members of the State Contractors' Association, and noting the amount of new work under way, I was informed by him that during the last five years all of the State and National banks had found it necessary to enlarge or rebuild their establishments to meet the present requirements, although previous to that time their accommodations had been sufficient to meet the demands through the past 20 or more years. I was also informed that they are enlarging to meet the demands of the farmers. At first thought this success is rather peculiar as we all know that the earth has not increased in size, neither has its composition changed; so we cannot account for this demand from this angle. I think I can account for it in the following manner. If you will look back about six or seven years, you will have arrived at the time that the free delivery became general in rural districts It also marks the time the farmer ceased to spend his time whittling on the barn

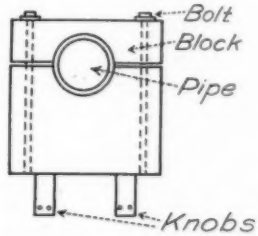


Fig. 3.—Cleat for Supporting Circuit.

fence and began to make use of this valuable service. Upon investigation he found that he could be informed each day of the condition of the farming business in general. He found that through the reports and experiments undertaken by the Department of Agriculture of our government and by experts in the employ of periodicals devoted to his own particular line of work he could develop portions of his land hitherto considered waste and untillable. He found a way to increase the output of that portion of his land which, at its best, barely netted him an existence. By studying the different periodicals which are brought to him daily by the rural delivery; by a scientific rotation of crops; by the use of modern machinery; and by taking advantage of the daily report of market conditions telling him when and where to dispose of his output, he finds himself today a finished business man whose only worry seems to be in placing his surplus to best advantage and deciding on what car he will buy next year. He has taken advantage of the opportunities which were placed at his door.

"Now comes the question: How many banks have been enlarged to meet the demand of the electrical contractors? I need not answer this. How many of us have taken advantage of the opportunities placed within our easy reach? Take the National Contractors' Association. This association is fighting every day in the interests of its members, and it is not fighting in vain; it is succeeding and its success means the success of its members. It is working to take the construction work away from the central station and place it in the hands of the contractors where it belongs. It is working to place the sale of electrical materials and appliances in the hands of the contractors. It is educating its members through its Sales and Data Book and its monthly publication, to use new and more convenient methods and materials in their business. It is teaching them the theory and practice of their business as it should be conducted to meet their present and future needs. It is teaching them as to what is a reasonable cost and resale price of their output and in general it is assisting the electrical contractors to advance in their chosen work at least in proportion with the other trades and occupations.

The State Association embodies all that is good in the National and enlarges upon it to meet the demands of the territory it aims to serve. Then there is our local association which deals with conditions at our very door. Then we have the periodicals which devote themselves to the matters concerning electrical contracting. We cannot say that we have not the advantages enjoyed by other trades and occupations when we stop to consider the work these bodies are doing. We must admit frankly that we have not availed ourselves of them, and we are like the old back number farmer who planted wherever he could and labored day and night and trusted to the good Lord that his efforts would yield a crop that would shield him through the winter months from the proverbial wolf. We put in a figure wherever we can and take work for whatever we can, work on it day and night, and hope Providence will see to it that we get an existence out of our efforts. Our condition is much the same as a shipwrecked party in the business sea grasping frail straws in the hope that we will accumulate enough of them to buoy ourselves to shore. Associations are the life-saving stations eager to send out assistance wherever requested; but, up to the present time, we have not seen fit to send a C. Q. D. to the saving stations though we keep on floating, sinking and grasping straws."

Movement to Require Licenses of Electricians in Chicago.

The following ordinance is pending before the City Council of Chicago, and the electrical contractors of the city are said to be strongly in favor of its passage. Whether it shall become a law or not the ordinance makes interesting reading for people engaged in the electrical business. It is given here in full, just as it was presented:

Section I.—It shall be unlawful for any person, firm or corporation, to conduct, carry on or engage in the business of electrical construction, or the business of installing electrical wires or electrical apparatus to be used for light, heat or power, or for any person, firm or corporation engaged in any other business to employ one or more persons as electricians for the purpose of installing, handling, or manipulating electrical wires or electrical apparatus to be used for light, heat or power, without first having obtained a license for that purpose.

Section II.—Any person, firm or corporation desiring a license as required by Section I shall make application to the City Electrician, setting forth therein the name and place of business of such applicant and stating therein the nature of the business of such applicant, the purpose for which such application is made and the name of the person who shall have direction of the electrical work in the business to be licensed, or, in the case of those in other businesses employing electricians, the name of the person to be employed for that purpose or for the purpose of taking charge or direction of the electrical work of such business. The City Electrician, upon receipt of such application, shall ascertain whether such applicant or the person having direct charge of the electrical work in any business to be so licensed, is competent to carry on or engage in the business of electrical construction, or in the case of other businesses employing electricians, whether the person to be employed for that purpose or for the purpose of taking charge or direction of the electrical work of such business is competent to install, handle or manipulate electrical wires or electrical apparatus to be used for light, heat and power. If the City Electrician shall be satisfied of the competence of such person or persons, he shall, upon the payment of a license fee of $25.00 to the City Collector, and upon the order of the Mayor so to do, issue or cause to be issued to such applicant a license authorizing such applicant to engage in the business of electrical construction, or the business of installing electrical wires or electrical apparatus to be used for light, heat or power, as the case may be. Every such license shall expire on the 30th day of April next following the issuance thereof. Such license shall be revocable in the discretion of the Mayor at any time for failure to comply with or violation of the ordinances of the city in regard to electricity or the installation or handling of electrical wires or electrical apparatus.

Section III.—Before the delivery of any license provided for herein to any applicant therefor, such applicant shall execute to the city a bond with at least two sureties to be approved by the City Collector in the sum of $5,000, conditioned that the applicant will faithfully preserve and conform to all ordinances in force at the time of the application or thereafter passed and during the period of the license applied for, concerning or in any manner relating to the business of electrical construction or installation of electrical wires and electrical apparatus, and to any and all rules and regulations of the department of electricity governing or regulating electrical construction or the installation of electrical wires or apparatus; and conditioned further to indemnify, save and keep harmless the City of Chicago from any loss, cost, damage, expense or liability of any kind whatsoever, which it, said city, may suffer from or which may accrue against, be charged to, or recovered from said city from or by reason of any act or thing done by licensee or by any negligence in the execution or performance of any work done by such licensee, or by or on account of any improper work done under and by virtue of the authority of the license so issued.

Section IV.—Any person, firm or corporation, licensed hereunder, shall be entitled to a renewal of such license without filing any additional application, upon the payment of the annual license fee and the renewal of the bond provided for herein.

Section V.—Any person, firm or corporation who shall hereafter conduct, engage in, or carry on the business of electrical construction or the business of installing electrical wires or electrical apparatus to be used for light, heat or power, or, being engaged in any other business, shall employ any person or persons as electricians for the purpose of installing, handling or manipulating electrical wires or electrical apparatus to be used for light, heat and power, without first procuring a license so to do, shall be fined not less than $10 nor more than $200 for each offense and a separate offense shall be regarded as committed each day on which such business is conducted without a license as aforesaid.

An exchange says that one of the things which the electrical contractor is prone to overlook is that we live in an age of specialists from whom this generation demands service at a price. The public when they need anything go to headquarters and expect to have attention of the best order given to their demands, and for such attention they are willing to pay full price.

Denver Convention of the Electrical Contractors.

As previously announced, the annual convention of the National Electrical Contractors' Association will be held in Denver, Colo., July 17, 18 and 19. At the opening session on the morning of July 17 there will be addresses by Governor Shafroth on "The Resources of Colorado;" by M. B. Bliss on "The Architect and the Contractor;" and by A. F. Traver on "The Relations Between the Central Station and the Contractor." Mr. Bliss is president of the Denver Chapter of the American Institute of Architects, and Mr. Traver is superintendent of the Denver Gas & Electric Light Company. All persons interested in the electrical industry are invited to attend the opening meeting.

In the afternoon there will be a sight-seeing trip by automobile and in the evening there will be a reception and dance at the Albany Hotel.

Business session for members only will be held on the afternoon of July 17 and the morning and afternoon of July 18. On the evening of Thursday, July 18, the annual dinner of the organization will be held, to which the ladies and representatives of other branches of the industry are invited. This will be followed by a vaudeville performance.

On Friday, July 19, an all-day trip will be taken over the Moffatt Railroad to the Continental Divide. This trip furnishes some of the most delightful scenery which can be reached from Denver.

Electrical Inspection Bureau in Louisville.

The Kentucky Actuarial Bureau, of which Clem E. Wheeler, of Louisville, is manager, has under consideration plans for the establishment of a department of electrical inspection. The bureau is the rating organization of fire underwriters in Kentucky. At present Louisville is covered satisfactorily, one inspector of the bureau co-operating with the inspectors of the lighting companies, but as far as the insurance interests are concerned inspection work outside the metropolis is limited to that being done by J. G. Fisher, who has charge of eastern Kentucky. He recently took hold of the position, having formerly been city electrician at Paducah, Ky. The organization of a separate bureau to handle this work will not only provide for its inauguration in western Kentucky, but will also increase the efficiency of the bureau in sections where the service is now in force.

A night telegraph letter service was inaugurated by the British Post Office on June 1. The rate is 12 cents for 36 words and one cent for each additional word above this number.

William McGuineas.

The electrical contractor should have confidence in himself. He should realize that he is a professional man of a type indispensable in modern industrial life, and that as such he has a right to a fee for professional services for every contract placed upon his books. In bidding on a prospective job, he should not be afraid to charge the proper price, and when the contract has been secured he should have the integrity to see to it that the work is all done thoroughly and well. He should always be careful to accord his competitors fair and equitable treatment. For example, cases may arise in which a property owner or other person in authority decides positively to employ a certain contractor to install a given piece of electrical work, and after having arrived at this decision asks his competitors for bids, this being a sort of covert process for getting the man who has already been decided upon to do the work to under-

William McGuineas,
President Illinois Contractors' Association.

take it for the lowest possible price. Contractors should be on the alert for this sort of thing, and not be a party to such unfairness.

Thus, in substance, argues William McGuineas, the newly elected president of the Electrical Contractors' Association of the State of Illinois, and that the doctrine is sound and good his own success in the contracting field is sufficient to convince one.

Mr. McGuineas was born in Michigan and he began life as a printer. He came to Chicago in 1888. Soon thereafter he decided to enter the electrical business, and, upon arriving at this conclusion, he secured a place with the Chicago branch of the Thomson-Houston Company, of Lynn, Mass. Beginning thus, he acquired, through practical experience, a comprehensive education along electrical lines. His experience afforded him training in the repair shop and in both inside and outside wiring construction.

In 1904 he took up the business side of the electrical profession by accepting a position with Rattenburg & Jones, of Chicago, as estimator and general all around hustler for electric-wiring contracts. He continued in the same capacity when this firm was consolidated with the Arthur Frantzer Company.

Soon after the great Baltimore fire the company just mentioned opened a branch office in Baltimore, and Mr. McGuineas was put in charge of it. He returned to Chicago after about five years in Baltimore, and in 1910 he and H. and W. H. Rattenburg organized the United Electrical Construction Company, with headquarters at 417 South Dearborn Street, Chicago. He is still connected with this firm in an official and executive capacity. During the past two years the firm has put in some of the biggest electrical installations in Chicago.

Mr. McGuineas has always taken an active and prominent part in the affairs of the Chicago Electrical Contractors' Association as well as in those of the State and National associations. He is serving his second term now as a director of the body first mentioned and is also a member of several of important committees. At the February meeting of the State Association he was the winner of one of the prizes awarded for the best addresses on electrical contracting delivered then. As noted elsewhere, he was elected president of the Illinois state association at its recent meeting in Rock Island. He is also being sent by the Chicago association as one of its representatives at the Denver Convention of the National Association.

Mr. McGuineas is a Mason, and a man whose circle of friends is large, and withal deservedly so.

Among the Contractors.

Frank S. Leasure & Son, 443 South Dearborn Street, Chicago, is wiring the Chicago Theater for 6 arc lamps, 300 incandescent lamps and 3 motors.

The White City Electric Company, 229 West Van Buren St., Chicago, is putting in an installation of lamps and motors for the Larkin Soap Company, of Chicago.

At the meeting of the Minnesota State Electrical Contractors' Association, which was held at Duluth on June 17, the following officers were elected: President, A. W. Lindgren, Duluth; vice-president, J. Nelson, St. Paul; second vice-president, S. O. Hartig, Minneapolis; treasurer, Mr. Nimis, St. Paul; secretary, G. M. Jones, Minneapolis; directors, Mr. Van Burgess, Duluth, and John Gorman, St. Paul.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing an Outlet.

In wiring an already-built house not long ago, I saw a scheme worked which interested me very much. It was a convenient method for making a right-angle turn in a circuit some distance from the nearest fishing point without the necessity of removing some flooring which otherwise might have had to be torn up.

The scheme employed is illustrated in Fig. 1. It was desired to place a bracket at the point marked *A* in the figure and also one at *B*. At *C* there was a pair of feed wires, and so the base-board was removed at this point. A regular steel

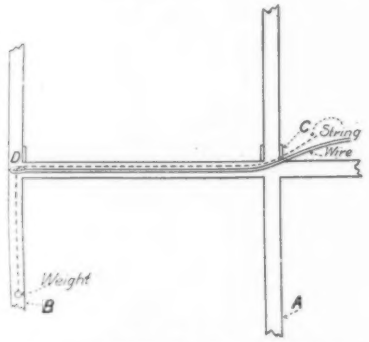


Fig. 1.—Method of Fishing Outlet B.

fish wire was bent into a ring and a cord with a weight attached was inserted as shown. The wire was then shoved in at *C* until the ring arrived at point *D*. Then by loosening the cord at *C* the weight was allowed to descend to *B*, where a pair of wires were attached and drawn back to point *C*. V. S. Beck.

Convenient Terminal Connector.

I recommend this lug to anyone who does outside testing, with portable instruments, and who has been bothered by the wire breaking off at the terminal. In making leads skin the insulation off the stranded wire for about two inches, place end in a vise so that skinned end is free, and wind No. 18 or 16 bare copper wire spirally around the skinned end, winding about three turns around the insulation to keep the wire from unwinding. Solder an inch of the terminal and tape the unsoldered part to about an inch over the insulation. The unsoldered part of the winding will act as a spring. This terminal has proved very durable in my work.

Charles Reimenn.

Small "Feeler" Bits.

A "feeler" bit that can be used where the regular small bits could not be employed—for instance in boring up through floors from below, or in locating a partition by boring down through the floor near it without making a conspicuous hole in the ceiling below. Take a stiff steel or other spring wire and anneal one end and bend it up in a loop or two so that the wire will not turn in the brace. Then file a sharp screw-driver-shaped drill point on the other end. A steel rib out of an unbrella having round ribs instead of pressed-steel ones, makes a capital bit, though smaller steel wires can be used if desired. C. W. Goddard.

Fishing Work in Partitions.

If you have trouble in getting a snake through a hole in a "header" up or down in a partition, try this method.

First push up a piece of pipe small enough to go through the hole.

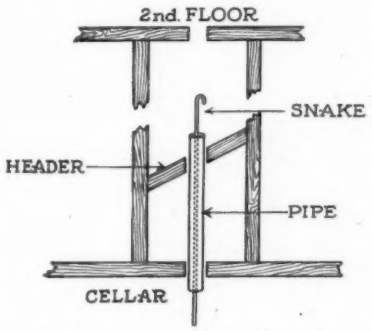


Fig. 2.—Pulling Wire Past Obstruction in Partition.

I use quarter-inch. With this it is an easy matter to find the hole. Then shove up your snake, through the pipe. After it has been hooked from above the pipe can be pulled out and the BX pulled through.

C. W. Higginbotham.

Fuse Protection for Shunt Coil of Meter.

Our company furnishes power to farmers from its 500-volt trolley lines, and we have had a great deal of trouble from the burning out of meters on this service. Many of the burn-outs seemed to be due to short-circuits caused by the 500-volt current following paths made by lightning jumping from one side of the line to the other within the meter. In order to overcome this I now place a half-ampere fuse in circuit with the potential coil of the meter. If after this has been done, a static charge makes a path, the 500-volt current cannot do any harm, as the fuse will blow and leave only one side of the meter alive. I solder the fuse in an old cartridge fuse, which is sealed in a fuse block.

Before I resorted to this expedient the meter was generally a total loss. We cannot depend on the main fuses for this protection, for we find that the farmers will use anything from iron wire to large nails for fuses. Of course, the current consumption between the blowing of a fuse in the potential coil and its replacement with another is lost; but this is not so bad as losing the meter itself.

W. A. Stevenson.

Emergency Connections in an Arc-Lighting Circuit.

Not long ago we found ourselves confronted with the problem of providing temporary means for boosting the voltage on an arc-lighting circuit which could be employed until standard equipment could be secured and installed. Our transmission system included 2,300-volt supply lines, and we happened to have on hand a couple of idle transformers which were wound for 2,300 volts primary, these being standard lighting transformers. We connected these in the arc circuit in the manner indicated in the diagram.

In explanation of the figure it is to be noted that the left-hand coil of each transformer is used to energize the core, and that the two coils are connected in series across the supply. The right-hand coils are connected in series to boost the voltage to 4,600 for the arc

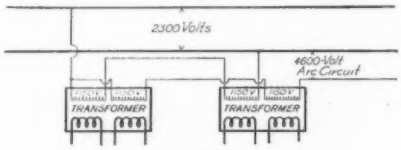


Fig. 3.—Diagram of Circuits.

circuit. The excess voltage is taken care of by the regulator.

Low-voltage coils are on open-circuit. W. H. Milligan.

Forcing the Fixture to Hang True.

In a recent job it was found that a pipe from which a fixture was to be hung had been torn loose and did not hang vertical. I took a piece of bar iron an inch wide and drilled five holes in it, two in each end and one in the center, the center hole being large enough to slip over the end of the pipe. I then screwed a locknut on the pipe, which projected through the ceiling, and bending the bar of iron in the shape of a stirrup, slipped it over the end of the pipe. By pulling it up against the nut I forced the pipe into the vertical position. The bar was then fastened to the ceiling and the pipe thus held in the right position.

Ed. O. Erlandson.

Among the Supply Men

The Downing Electric Company, Des Moines, Iowa, was established in 1905. This company covers Iowa exclusively. The company reports business conditions picking up materially. The officers of the company are J. E. Downing, president; Mrs. H. C. Downing, vice-president; H. C. Downing, secretary and treasurer. The latter is the active member of the company.

The Electric Supply & Equipment Company, Hartford, Conn., is distinctively a wholesale concern. The company reports business fairly quiet with no special demands from any part of its territory, which covers New England, New Jersey and Pennsylvania. The company does no retail business. H. E. Page, president of the company, is one of the familiar figures at the supply jobbers' meetings.

Frank Fowden, manager, and E. A. McInerney, secretary, of the Brooks-Follis Electric Corporation, San Francisco, Cal., are two mighty popular supply men, not only on the coast, but all over the country. This company is doing a big business in a rapidly growing territory, handling particularly some especially heavy apparatus.

The Tower-Binford Electric & Manufacturing Company, Richmond, Va., does a retail business to a limited extent. This company reports conditions rather quiet. Their territory covers Virginia, North Carolina, South Carolina, parts of West Virginia, Tennessee and Georgia. The business was established in 1889. Julian Binford, who is a prominent Jovian, is one of the most popular men in the business.

A. W. Lewin, treasurer of the Ed. Spranley Electric Company, New Orleans, La., says that business has been pretty quiet all during the winter and spring, but the indications are that things will look up to a considerable degree in the near future. The business was incorporated April 1, 1911, and for about eighteen months prior was carried on as an individual business by Ed. Spranley, president of the company. L. F. Barbier is secretary. The company covers New Orleans and part of Louisiana, catering especially to the local isolated plant business, 75 per cent of this business being handled directly in New Orleans.

The Stubbs Electric Company of Portland, Ore., does, in addition to a retail supply business a wholesale jobbing business with sales organization extending throughout Oregon, Washington and Idaho. At the company's store, corner of Sixth and Pine Streets, an unsually well arranged and complete stock of supplies is displayed and a complete stock of wireless apparatus is carried. O. B. Stubbs, who is head of this company, enjoys a wide personal acquaintance with the electrical trade in the Northwest.

Edwards & Company, Incorporated, of New York City, and Havens Electrical Supply Company, of Albany, have been elected to membership in the New York Electrical Credit Association.

The Northern Electrical Company, Duluth, Minn., has been conducting a vigorous campaign for the sale of pneumatic vacuum cleaners, and reports considerable success in this line. While trade conditions were particularly dull the first three months of the present year, they have been picking up during April, May and June in a very satisfactory manner. The lamp sales particularly have been very satisfactory, and this is undoubtedly due to the decreased cost to the consumers. F. A. Johnson, of the supply department of the Northern Electrical Company, left on his vacation on June 15, which will also include a wedding trip. A. W. Lindgren, business manager of the company, says it is too bad that each one of us cannot take a vacation like that each year. George C. Maudslay, formerly with Drake & Gorham, electrical engineers, of London, England, and later with the Pittsburgh Coal Company, of Duluth, as chief electrician, has been engaged in the capacity of traveling salesman for the Northern Electrical Company. K. R. Hare, a graduate of the University of Wisconsin, and later in the testing department of the General Electric Company at Schenectady, has assumed the position of store salesman with the Northern Company. Mr. Lindgren will attend the convention of the National Electrical Contractors' Association at Denver, next month.

George W. Vallee, Jr., who for the past year has acted as general manager of the George W. Vallee Electric Company, 1533 Atlantic Avenue, Atlantic City, N. J., is now connected with the Interstate Electric Company, of New Orleans, and will cover the state of Florida. Mr. Vallee, Jr., is well known among the electrical trade, having been connected with one of the first electrical supply houses in Philadelphia. Joseph T. Prendergast, formerly of the Irish Electric Company, New York City, and previously connected with the George W. Vallee Electric Company, is now acting as general manager.

J. L. Nunn, of the Nunn Electric Company, Amarillo, Texas, has just returned from a southern trip. While on this trip he attended the convention of the Southwestern Gas and Electric Association, at Oklahoma.

B. Z. Downs, of the St. Paul Electric Company, St. Paul, Minn., writes that there is no unusual business in any particular territory, but that it seems more regular and steady than at any time during the past nine months. He also reports that telephone companies and central stations are increasing the use of carbolineum-treated cross-arms and poles. Business was suspended for a few days owing to everybody being out catching bass, the photograph of Mr. Downs' catch not being clear enough to reproduce.

The salesmen of the American Electrical Supply Company, Chicago, Ill., held a meeting on June 21 and 22, and report that they are experiencing no unusual business demands from any particular territory.

B. F. Kierulff, Jr., & Company, of Los Angeles, Cal., are now pushing the sale of two local products—glass insulators, made by the California Glass Insulator Company, of Long Beach, and eucalyptus pins, made by the California Eucalyptus Lumber Company, of Oxnard, Cal., and report that they are meeting with much success in both cases. Kenneth Shibley, formerly an engineer in the employ of the United

States Reclamation Service in Arizona and New Mexico, is now in charge of the engineering department of the Kierniff Company.

The Electric Traction Supply Company, of St. Louis, Mo., is putting forth a vigorous campaign for all kinds of supplies, and reports that business so far has been good, with bright prospects for the future.

Leroy A. Mills, president of the Mills Electric Company, Peoria, Ill., reports that J. B. Riley, a salesman for the Mills Electric Company for the past eighteen months, has resigned his position to conduct an electrical supply department for August Schmitt & Sons of Evansville, Ind. O. A. Cole, who for some years has been with the Western Electric Company and the Central Union Telephone Company, takes the territory formerly covered by Mr. Riley for the Mills Electric Company. The company reports brisk business for transmission-line material and an active demand for opening stock at Evansville, Ind.

Earl C. Sweeten, formerly in charge of the Brilliant Electric Company's Cincinnati office, assumed charge, on June 1, of the incandescent lamp department of the Union Electric Company, Pittsburgh, Pa.

Oscar Avery, president of the Avery-Loeb Electric Company of Columbus, Ohio, reports that they are pushing the sale of Mazda lamps in 14-inch Alba spheres. They have issued a bulletin which shows the advantages of electric lighting for shops and stores, and this, together with their sales campaign, has resulted in a brisk demand for their line of material. They also report that many independent telephone companies are repairing old lines and replacing overhead wires with cables.

The Co-Operative Club of the Harry I. Wood Company, 514 West Main Street, Louisville, Ky., gave an outing at the residence of W. A. Link on Decoration Day. They were entertained in the afternoon by a visit to the locks, which are being enlarged at the present time. They returned to Mr. Link's home, and after partaking of a sumptuous repast, visited one of the local theaters. All present enjoyed the holiday.

Public Service Commissions

NEW YORK.

The Public Service Commission for the First District, New York, has adopted an order which provides for an extension of time in which to comply with the requirements of the former order of the Commission requiring the equipment of surface cars with power brakes. Tests under the supervision of George L. Fowler, an expert employed by the companies, occupied several months. Hand brakes of several types and also power brakes were tested on cars of different weights, at different speeds and under different rail conditions. Mr. Fowler made a tabulation of his test records which was introduced in evidence and testified that in his opinion, based upon these tests, geared hand brakes of an improved type were superior to power brakes on cars of the weights tested. As was shown at the original hearing, however, power brakes are now in general use both in this country and abroad. The Commission therefore held that it should require stronger evidence to prove that this substitution of power brakes for hand brakes had been ill-advised or ill-considered and was not based on intelligent experience. The time on the order was consequently extended.

Commissioner Milo R. Maltbie of the First District will conduct a hearing on July 2 with reference to the question of meter-testing practice as to all electric corporations furnishing meters on premises of consumers.

The Commission has granted the application of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company for approval of a supplemental mortgage to secure an issue of $1,200,000 five-per-cent bonds redeemable at 110.

The Public Service Commission, Second District, has recently created a Division of Transportation which will have charge of the inspection of the maintenance of way and operation of the steam railroads within the state, the investigation and classification of all accidents, and such other special investigations or inspections as may be assigned to it. It is expected that this division will also make inspection of the interurban electric lines. In organizing the division, C. R. Vanneman, who for the past two years has been a steam-railroad inspector for the commission, was promoted to be chief.

The Public Service Commission, Second District, has made an order requiring the New York Telephone Company to reduce its rates so that subscribers living in the town of Elmira in the district known as West Elmira shall be charged the same rate for telephone service as is charged in the local area in the city of Elmira. The telephone exchange is situated about 2¼ miles south of the northerly line of the city and 1⅜ miles east from the westerly boundary of the city. The hamlet of West Elmira is a distance of about 2 miles from the telephone exchange, which is less than the distance from the northerly line of the city to the telephone exchange; but the company has been making an additional mileage charge which fixed the rates to be paid by West Elmira subscribers at $12 a year more than the rate charged within the city limits. The Commission finds that the mileage charge made is unjust, unreasonable and unjustly discriminatory and that the just and reasonable charges are those now charged for like service within the territorial limits of the city of Elmira. The company is required to put the new rates into effect July 1.

The Public Service Commission, Second District, has authorized the Tri-County Light & Power Company to exercise franchises granted for the furnishing of electricity for light, heat and power in the town of Gilboa, Schoharie County. The Commission has also authorized the company to issue its common capital stock to the amount of $5,000 and its 30-year five-per-cent gold bonds to the aggregate amount of $60,900. The bonds are to be sold at not less than 95 and the proceeds are to be used for the construction of a dam, power house, electrical apparatus and attendant expenses, and the construction of a transmission line from Gilboa to Stamford, distribution line in Gilboa, and distribution line in Grand Gorge.

The Public Service Commission, Second District, has authorized the Wayne Power Company to issue its common capital stock to the amount of $10,000 and its six-per-cent ten-year bonds to the amount of $105,000. The stock and bonds are to be sold at par and the proceeds are to be used for the building of a transmission line from Wayland to Avoca, Atlanta, Coshocton and Wallace.

Questions and Answers

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 71.—Comparative Reliability of Gasoline and Electric Trucks.—Have any of your readers comparative data showing the time for a period of, say, one year that gasoline and electric trucks of two tons capacity are out of service due to breakdowns or repairs?—W. N. R., New Orleans, La.

No. 74.—Electric Starter for Automobiles.—In the electric self-starters now being used for gasoline automobiles what provision is made against overdischarging the battery in case the engine refuses to start? What prevents the battery being continually overcharged?—V. B., Milwaukee, Wis.

No. 76.—Rewinding Fan Motor.—I would like instructions for rewinding an old-style Western Electric 16-inch fan to use as a small dynamo for gas-engine sparker to generate 10 volts and whatever amperage I can get. The dimensions of the armature are 2.5 inches diameter, 1.25 inches long, with 14 slots drilled with five-sixteenths drill. The field piece is of steel, the coils were 3 inches in diameter and 2 inches long, with 1.5-inch hole inside. The speed of the dynamo may be whatever suits the machine best. The size of the commutator is 1.25 inches diameter and 1 inch long.—F. A. J., Topeka, Kans.

No. 77.—Storage-Battery Launch.—What capacity of storage battery would be required for running a 30-foot launch that accommodates 20 passengers in ferry service? The boat is to make a quarter-mile trip about every half hour and needs to run at only moderate speed. Charging facilities will be at main dock only. Ten lamps must also be supplied in the evening. What size of propelling motor is needed?—N. S. J., St. Louis, Mo.

No. 78.—Patentability of an Article Already in Use.—If an article has been invented by a man who does not consider the invention of sufficient value to secure a patent thereon, and if the article has been manufactured and sold in very limited quantities by the original inventor, can another party secure a patent on the article when the original inventor knows, but cannot legally prove, that the second party got his idea from seeing the article in use?—F. L. T., Duluth, Minn.

Answers.

No. 61.—Opening Exposition From A Long Distance.—After reading that a prominent man had started the wheels of an exposition by pressing a button over 1,400 miles away, I had a dispute with a man who asserted these stories are pure fakes, and that he did not believe it was possible and knew at least one case where merely a telegraphic signal to the operator in a substation had been sent. I contended that a telegraph relay can easily be arranged to control the necessary switches. Was I right?—H. B. D., Faribault, Minn.

The opening of an exposition from a distant point I find is frequently done by a signal, the switches and machinery being set in motion by men stationed at the same. There is no doubt but that all of the machinery could be automatically set in motion, but the expense of the remote-control valves, switches, etc., would be prohibitive. If there were only electric switches and motors to operate the problem would not be so complicated, but when there are steam engines, turbines and pumps there would have to be special apparatus designed which would have to be discarded after being once used.—C. T. P., San Francisco, Cal.

No. 69.—Fishing Wires.—In a recent article I read that the use of jointed rods is better for fishing wires in walls than the use of a chair and fish tape. What is the "chair and fish tape" method? What method is used to make the fish tape take elbows and jogs in conduit better than a simple band in the end? I have read of a spiral spring with a ball on the end, yet old journeymen whom I have asked profess never having heard of it. Are these attachments on the market?—C. W. G., Muskegon, Mich.

Is this not the chain and fish-tape method? If such is the case, it probably refers to the attaching of a short piece of chain to the ordinary fish tape or snake. In fishing down between walls I usually have a stout line like a mason's chalk line to which there is attached a short length of chain having a fairly large link. This chain acts as a weight and serves to pull the line down the channel. The chain will slip over and around slight obstructions such as plaster keying. Another advantage of this is that it will cause sufficient noise when shaken, so that it may be easily located. This enables one to know where to reach for it. If one is fishing from above, say, to a switch, the chain can be dropped from the opening in the floor above down as far as the switch opening and then the helper can reach in with a hook on the bared end of a scrap of wire and in four cases out of five he will secure the line at first attempt. The cord and chain are heavy enough to carry the wire and the flexible tubing which should be put on at this time. If the wire to be installed is heavy, then it is necessary to fasten a heavy hand line to the cord, then this is used to pull the wires into place. Like the questioner I have heard of the spiral spring and ball end, but am unable to locate one of the devices and in lieu of it I used the regular type of fish tape or made a legitimate number of floor openings and properly supported my lines which is the cheapest in the long run. In pushing snake or fish wire through a conduit I have found that the case is a pretty bad one where the simple hook will not pass around or through the pipes and their bends. I always use a hook bent like an ellipse and then cut a little off the loop so that the end is still pointing to the tape. This prevents the end of the loop catching as the tape is pulled out. This end if allowed to point out from the tape may drop into the space between the ends of two pipes that are not tightly butted together and, if you have trouble in pushing the wire through forward and the above happens, you may be sure that you will have trouble in pulling the wire out. It is frequently necessary to help the fish wire by reaching in from the distant end of the pipe with another fish line. If you have to do this, tie a piece of twine to the end of the second wire; do this so that there will be several loops in the cord which should be tied so they will hang open. Pass the second fish wire into the pipe and touch lightly to the teeth occasionally and, if the two wires are touching or passing, the peculiar vibration can be felt; then by a careful manipulation the loop or cord will be caught by the hook and the ends pulled to the point where the wire is to start from. Make the wire fast to the snake and you are ready for a pull.—D. S. J., Pittsburgh, Pa.

I have never heard of a method of fishing referred to as the "chair and fish tape" method but it must mean the use of a fishing tape, which is a tape of spring steel about one-quarter-inch wide and from 5 to 100 feet in length. By rolling the end of this tape back about one inch it will take bends in conduit fully as easily as if it had a ball on the end. A fishing wire head made of a spiral spring with a ball on the end is made by the Manhattan Electrical Supply Company, of Chicago, and is cataloged as a "snake charmer." The ball in this case will bounce over any obstruction in the pipe that leaves enough room for the ball to pass through.—O. L., Decatur, Ill.

No. 70.—Arrangement of Three-phase Line.—In building a three-phase power line, is it better to put all three wires on one cross-arm or to arrange them in a triangle with one on top? Can the top wire be placed right on top of the pole itself so as to require only a short cross-arm for the two lower wires?—N. T. P., Charlotte, N. C.

The writer has been engaged in

electric line construction for 30 years and has found from experience that it does not pay to put high-tension wires upon brackets. Brackets are easily pulled off and after a few years the spikes will become eaten off and rust and leak "juice." A good cross-arm properly braced and put on with center bolt will cost but very little more than the bracket and will look and be better. Put two wires on one side and the other wire on opposite side of pole on end pin; that will leave room for a man to get between the wires with ease.—O. P. S., Denison, Tex.

Common practice tells us to use the top of the pole as a support for one of the wires of a three-wire or a three-phase system. There is a special fitting for the pole top which is not expensive. Where these pole-top pins are used the pole should be roofed to fit the base or the pin should have supports long enough to be secured to the sides of the pole, because of the difficulty of fastening to end grain of wood. The plan of using the pole top for one wire shows good construction. The triangle formed by the three wires should be symmetrical, preferably an equilateral triangle. The space between wires is determined by the voltage of the system. Other factors such as inductance and capacity enter into alternating-current line construction but unless the lines are very long, voltage very high and current is heavy these will not affect the operation noticeably. Be careful to get the cross-arm long enough to give the lineman plenty of shoulder room as he climbs through.—D. S. J., Pittsburgh, Pa.

No. 72.—Wind and Wireless.—I have heard that strong wind blowing across an electric transmission line sets up static charges on the line. Since it has come to be the practice to use horizontal antenna wires in wireless telegraphy, does the blowing of a strong wind across these wires interfere with the working? Is there any disturbance of the delicate receiver from this cause?—H. T. M., Crown Point, Ind.

I have built and operated a wireless station in Pittsburgh, but at no time have I noted any variation in the static disturbances during high winds. Possibly the antenna wires are so short in comparison with the length of a transmission line that the effect on them is inappreciable. As messages were received from the Atlantic coast stations under all conditions I can speak from experience in the matter. The use of inductive tuners and variable condensers largely eliminates the effect of static, the latter passing to ground through the primary of the tuner, so that any slight increase in disturbances of the character noted would hardly affect the receiving apparatus.—F. M. J. M., Middletown, O.

No. 73.—Placing of Wall Receptacles.—Where is the best position for wall receptacles, in or close to the baseboard or about three or four feet above the floor? If placed close to the floor, do they not become more easily clogged with dirt in sweeping?—J. S. D., Jackson, Mich.

In placing wall receptacles, I generally place them about six inches above baseboard, for these reasons: (1) in case of removing baseboard, you must remove receptacle in order to prevent breaking of same; (2) in washing floor it is impossible to wet receptacle, therefore preventing short-circuit. In many cases it is a matter of question as to where the customer will allow it to be located, as some do not like to have baseboard damaged, and others again do not want the wall damaged, so it is best to have the customer's opinion as to the location desired.—A. S., Brooklyn, N. Y.

The proper location of wall receptacles will depend somewhat upon the nature and expected location of the operative device which is to be connected to the receptacle. In most cases, however, it is the writer's experience that the receptacle should be located in the baseboard as the extension cord is less likely to be in the way than if it were placed three or four feet from the floor. Another reason is that if the position of the outlet must later be altered, or extra outlets provided, the work can easily be done on the surface of the baseboard, and being low down will not be so conspicuous as would be the case if connections had to be made at a box three or four feet from the floor. There is no great danger of clogging the receptacle with sweepings in any ordinary room; none at all, in fact, if one of the numerous good flush-type receptacles with tightly fitting shutters is used. The only trouble that the writer has experienced has been the inconvenience resulting when some heavy piece of furniture must be located in front of the receptacle, but this would apply also to one higher up if the furniture were a bookcase, roll-top desk or similar article. In many rooms, particularly offices, a strip of wood known as a "chair rail" is carried around the walls at a height of three feet from the floor, and this makes an excellent location for outlet boxes, and also affords an easy path for extending wires to new outlets, the wires being run either on its surface, or concealed behind it. Chair rails, however, are frequently removed to gratify the taste of later occupants, so on the whole, it would seem that the baseboard is the ideal location for wall receptacles.—H. A. C., Pittsburgh, Pa.

When installing wall receptacles the correct place will nearly always be determined by the conditions to be met. In some places it is extremely unwise to place the receptacle too near the floor owing to the chance for dust and dirt from mopping, while in others it is necessary to obtain as much wall space as possible even at the expense of cleanliness in the wall receptacles in the room. When the machines, shelves, etc., mounted on the wall will permit it is advisable to place the receptacle 12 to 18 inches from the floor. The latter distance is even preferable to the former. This height makes the receptacle readily accessible without liability to dirt. When shelves, racks, or other equipment are mounted on the wall less than this distance from the floor it is, of course, necessary to place the receptacle nearer the floor but trouble from dirt can be minimized to a great extent if some type of flush receptacle be used in preference to the porcelain socket. The slots for the plug terminals are small enough to prevent anything of size getting into the receptacle and will reduce the chance for dirt whereas the exposed porcelain socket is very apt to catch the broom or mop used in cleaning the room. If a flush type can not be obtained readily a porcelain socket may be used in connection with a combination plug having a section which will pull out from the base. The base may then be left screwed into the socket at all times and the same results obtained as with a flush receptacle excepting that the porcelain socket will project and be a little more in the way of any one working near it. In addition to the feature of cleanliness there should be taken into consideration the ease of wiring the receptacle with regard to the necessary molding run or the placing of the wiring in the wall.—E. C. B., Kansas City, Mo.

No. 75.—Starting a Distant Pump.—We are planning to install a four-stage centrifugal pump which will be driven by a 75-horsepower, three-phase induction motor supplied with current from a central station a mile away. The pump will deliver water to a standpipe, equally distant, against an average pressure of about 90 pounds. Is there any practical way of starting this pump without sending a man to the pumping station? There will be a check valve in the discharge line. Is there an automatic way of priming such a pump?—J. W. L., Chapel Hill, N. C.

We are operating a 20-horsepower, three-phase, 220-volt motor for pumping purposes located about two miles from the power house. By using a No. 30 Cutler-Hammer starter it is only necessary to throw main switch at power house to start motor, the starter being located at pump house. This starter is also provided with pilot-switch connections by use of which the motor may be started by float switch.—H. I., Redwood Falls, Minn.

[Other answers held for July 13 issue.—Ed.]

MEETING OF ILLINOIS ASSOCIATION OF ELECTRICAL CONTRACTORS.

Semi-Annual Convention, Rock Island, June 14 and 15.

The Illinois electrical contractors held the semi-annual meeting at the Harper House, in Rock Island, June 14 and 15. The meeting was opened on the morning of the fourteenth, and various matters pertaining to contracting were discussed, the principal one being the new compensation law as it applies to the contracting business and the carrying of insurance both for employes and public liability; also the proper method of notifying employees as to the matter of the provisions of the bill. A committee was appointed to take up the matter and to advise the members as to how to protect themselves against damages.

It was decided in convention to have the by-laws and constitution of the Association printed on sheets that will fit the Universal Data and Cost Book issued by the National Association. It was also the sense of the Association that the National Association be asked to furnish sheets containing the National by-laws and constitution, the Underwriters' Code, and a list of approved fittings, all on sheets that will fit into the holder furnished by the National Association, thus giving in one book a complete list of things needed in the contracting business.

This being the June meeting, the annual election was held. This resulted in the selection of the following officers. President, William McGuineas, Chicago; vice-president, J. T. Marron, Rock Island; secretary, M. N. Blumenthal, Chicago; treasurer, F. L. Pierce, Chicago. C. E. Stapp, of Peoria, J. T. Marron, of Rock Island, and R. C. Bierdemand, of Chicago, were selected as Illinois directors to the National Association. L. C. Crawley, of Peoria, E. J. Prendergast, of Rockford, and Guy Carlton were elected as state directors for the year.

The Peoria contractors went to the convention attired in white hats and linen dusters, and carrying a bunch of tags asking for the January meeting of the Association. They marched into the meeting blowing tin horns, and were successful in securing the meeting to be held in January, 1913.

It was also the sense of the Association that the members and delegates going to the National meeting in Denver be instructed to work to secure for Chicago the National convention next year.

The Education Committee reported on the work that it had had in hand since the January meeting and gave a full description of a system that would give to the contractor a detailed statement of his costs on each job done. The report was made by F. L. Decker, of Chicago, who illustrated his talk with the sheets used by him in his regular business. The bookkeeping is all in one book and consists of several sheets ruled and lettered to take care of the various accounts. After a job has been figured and the job secured, a sheet is made out for the material necessary to rough-in this particular job. This is made in triplicate, one going to the stock man who gets out the material, the second going out to the job with the material, and the third remaining in the office. The sheet that first receives attention is the Cost Sheet. On this is entered from the sheet that has the material on, the amount of material sent on this particular job. On this Cost Sheet are headings for roughing-in, finishing, and credits, for material returned. Above this heading are the spaces for the architect's name, owner, and general contractor. On the following sheet is entered the material delivered to the job, and labor and all other expense that is incurred in the roughing-in; further on, as a credit is entered the amount of 60 per cent of the contract price. Now if all items needed to rough-in with a charge of a certain per cent to cover overhead expense are combined and the sum taken from this 60 per cent of the contract price, it will at once be seen where the profit or loss comes and exactly how much. This can be carried out to the exact percentage and the contractor can tell exactly how much the roughing-in has cost. Another thing is the charging up of the 60 per cent of the contract. By doing this it does not give the books a false value of the accounts receivable by showing a charge for the whole job while it is only partly completed. Now, with this charge, one charges up the 60 per cent to the party who is having the job done, and it should be in the contract that 60 per cent is due when the roughing-in is done.

In addition to the sheet above are the following sheets. A Recapitulation sheet with headings for sales, merchandise, labor, overhead commissions and a total column. This is used as a recapitulation sheet, and if carried out will give exactly the cost of the job. A cash sheet is used and all cash sales from the register are entered on this and all credits are made for cash deposited in the bank. A check-record sheet is used and on it are entered all checks drawn. This is also used to show how the bills are paid and when. A sheet for bank statement is provided, showing all deposits and checks drawn, so that when a balance is struck it should correspond with the bank balance, allowing for the checks that have not been paid and are still standing out. A sheet of invoices payable is also included here.

The idea of these sheets is to avoid a number of journal entries and also to show costs, as that is where so many of the contractors are weak in not knowing the absolute cost of any particular job, especially the expenses of operation; that is, the fixed costs or overhead, as it has been called. Expenses can be divided in twenty different accounts, among which are tools, car fare, outside labor, interest, association dues, commissions, exchange, delivery, etc.

Two other good ideas suggested by the speaker were the use of two kinds of postals with printed forms on them for extra work that is wanted on a job. This card can be mailed in if the job is far out and the workman does not come to the shop; also the use of a postal card ruled to suit for an individual time card for the workman, who can mail it to the office. Another card that can be used as a postal is ruled off to show where and what material is to be returned from a job that has been finished. This is another leak that needs attention, since too often men are sent out to get material from a job and do not return all that is there to be returned.

The sheets as used by Mr. Decker are 12 by 14 inches, and are punched for a loose-leaf binder, and index sheets are provided with leather tabs on which are printed the names of the various accounts. It is estimated that this book with 25 leaves of a kind and the indexes and cover can be made up at a cost of ten dollars. In the use of this, three books like those used in dry-goods stores, or else triplicate sheets, should be used, one for orders received, one for material going out and the third for material returned from jobs.

And it was the sense of the meeting that the Committee secure some of these books for the members, and see if by the use of these it will not induce the better keeping of accounts to show just where each contractor is as to the costs of jobs. It not being necessary to use the larger books, since with the start that the three small triplicating books will give the contractor, it is contended that he will then want to know more just what the cost of the jobs are; also it will make a uniform sheet that will avoid the use of any scrap of paper that happens to be handy and the possible loss of the same.

A pink ticket that has printed on it spaces for names and numbers of parties calling up when the contractor is out will often be found a very useful thing to remind one that a call has been made in his absence.

The system as outlined by Mr. Decker is not a complicated one and is one that the average contractor can adopt without making more bookkeeping than is necessary. In fact, one person who can

attend to the telephone and keep office, and can maintain the books on the system. Yet in a minute the certain cost for work can be accurately determined, both as to material and labor; also the other expenses of doing business.

Other members spoke of the ways they had of keeping the various records, one system in particular being the use of the Globe register that makes the three copies. As these are numbered it is impossible to lose a charge of a bill of material.

The last sheet of the series as shown by Mr. Decker was a sheet for distribution of merchandise, showing all the merchandise purchased each month. This will, when footed, show at a glance the total amounts purchased each month. A petty cash voucher is used and a pay roll can be made on the reverse side and the total amount of the pay roll entered in one amount on the face.

The idea of the committee was not to make a system for the large contractors as they nearly all have their own systems. It was rather to make one that will be applicable to any size business, and the one already in use was used to show how nicely it can be employed to get the desired results.

The report of the committee was received and a vote of thanks was given them, and the committee was continued. Just how the educational campaign is to be prosecuted was not decided, but a series of letters of education was suggested.

Mr. Pierce, of Chicago, gave a talk on the value of Association work and was followed by others who spoke in the same line.

Twenty-eight applications for membership were received and accepted, making the state association nearly one hundred members, of which over half are also members of the National Association.

It was further decided to boost Chicago for the next National meeting and the members going to Denver were instructed to that effect.

The committee that got up the program for the convention deserves praise, as it was followed to the letter and everything came off as billed. For entertainment the first evening a boat ride was given on the Mississippi, and during the ride the salesmen pulled off a minstrel show with a number of hits that were appreciated by the audience. On Saturday afternoon an auto ride about the three cities was given to the contractors, and this was followed by a ball game between the supply men and the contractors, in which for the first time the supply men defeated the contractors. It took eleven innings to do it and the score was 8 to 7. This was one of the best games that has been played for some time and was much enjoyed by the contractors and visitors. In the evening the banquet was held at the Harper House and one hundred and fifty contractors and ladies and supply men sat down to the tables. After the banquet the supply men pulled off another minstrel show that took with the banqueters. The entertainment was closed with a few good speeches and all departed with the remembrance of a successful convention.

The Illinois association is growing and all members are aware of the good that will come from Association work as the work of the Educational Committee showed that the results can be obtained by the use of some good system.

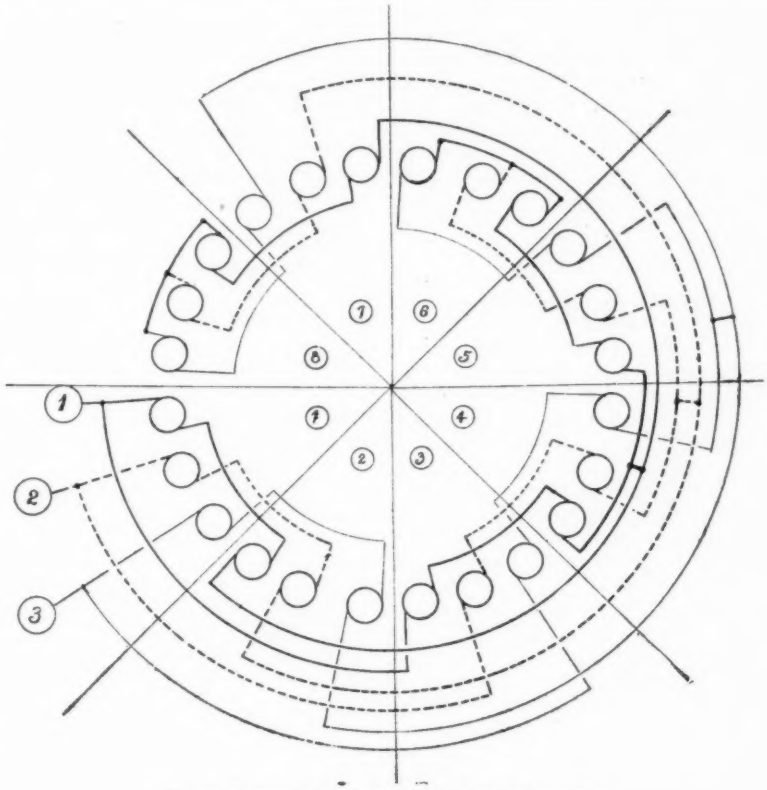
Huge Canadian Hydroelectric and Water-Supply Enterprise.

It is announced from Toronto, Canada, that the Government of Saskatchewan has made a contract by which the Canadian Pacific, Canadian Northern, and Grand Trunk Pacific railways will spend $20,000,000 in diverting the South Saskatchewan River to supply water to Regina, Moose Jaw, and Weyburn, and other cities, and also in developing 30,000 electrical horsepower. A commission has been appointed to prepare the plans.

There are at present installed in the United States and Canada about 80,000 electric signs, containing about 8,000,000 incandescent lamps.

Diagram for Motor Connections.

A method for showing the connections of an induction motor by diagram has been suggested by Jackson L. Edwards, of Macon, Ga., and is illustrated in the accompanying diagram. This drawing represents the primary side of a two-circuit, star-connected induction motor for a 550-volt, 60-cycle, three-phase circuit. There are 96 slots and each coil contains eight turns of No. 8 wire. Each small circle on the diagram represents four coils in series. The radial lines from the outside and inside of the small circles represent the top and bottom of respective series of coils.



Winding Diagram for Two-Circuit Star Connection.

The same method of showing the winding can be used for either primary or secondary. Mr. Edwards claims that this circular method of drawing the connections in the diagram is a great improvement over that in common use.

Tennessee Coal Output.

The production of coal in Tennessee in 1911 was 6,433,158 short tons, valued at $7,209,734, according to a statement by Edward W. Parker, just made public by the United States Geological Survey. This was a decrease from the output of 7,121,380 short tons, valued at $7,925,350, in 1910, of 9.66 per cent in quantity and 9 per cent in value.

Canadian Electrical Association Convention.

Ottawa, Canada, June 19-21.

The twenty-second annual convention of the Canadian Electrical Association was held at Ottawa, Canada, on Wednesday, Thursday and Friday, June 19, 20 and 21. The meeting took place in the Chateau Laurier, the new palatial hotel which has just been erected by the Grand Trunk Pacific Railroad, some 250 delegates being present. The address of welcome was delivered by acting Mayor Hinckley, who expressed the pleasure he and his associates had in seeing so many prominent men in the electrical profession in the city, and hoped that the members would take advantage while in the capital of visiting the Government buildings and other points of interest. President A. A. Dion replied in his usual happy style, thanking the mayor for the cordiality of his greeting.

President's Address.

President Dion, in his address which followed reviewed the work of the Association and expressed his pleasure that he was able to end his term of office at a convention held in his home city. The City of Ottawa, he said, was growing very rapidly, and a great many improvements were being made, and he was glad to say the electrical people were doing all in their power to assist in the work. He was pleased to note the growth of the company sections and the general prosperity of the Association. He felt, however, that it was time for him to retire from the presidency so that younger men with new plans and new ideas might carry on the work of the Association, in a more effective manner.

The report of the secretary-treasurer was the next order of business, and the report was read by T. S. Young. At the conclusion of the report Mr. Young said that he regretted very much owing to the pressure of work he would not be able to continue in the office of secretary-treasurer. He regretted this all the more on account of his long connection with the Association, but he felt it would not be right for him to attempt to carry on the work. R. F. Pack and A. L. Mudge in moving and seconding the adoption of the report expressed their deep regret that Mr. Young had found it necessary to resign. It was moved by Frederick Nicholls that the Association should in some tangible form express their appreciation of Mr. Young's past services, and suggested that this should take the form of an illuminated address. The motion was seconded by P. H. Kemble, and was carried by a standing vote. Mr. Young thanked the members for their kind words of approbation, and hoped that he would still be connected with the Association though perhaps not in an official capacity.

The president called on Frederick Nicholls to say a few words at this time as he understood Mr. Nicholls on account of business engagements had to leave on the evening train. He felt sorry that Mr. Nicholls could not be at the banquet which would be held on the following evening and give an address which all were looking forward to. Mr. Nicholls expressed his regret also at being called away as he had looked forward to meeting many friends and spending a pleasant time at the meetings.

The next order of business was the report of the Membership Committee, but D. H. McDougall not being present the president stated that the secretary's report gave a fair idea of the work which had been done by that Committee.

Meter Committee.

The report of the Meter Committee was read by L. V. Webber, the chairman, who gave a resumé of the conditions now obtaining in regard to meters which were now being sold in Canada, and intimated that there was an extensive field for demand meters and indicators, and thought that the combined integrating and demand meter which was now being put upon the market might prove an advantage to the companies. The maximum demand meter was, he thought, of great importance in connection with the sale of large blocks of power, as those contracts were usually made on the demand basis. He referred to the publication "The Electrical Meterman's Handbook" which had been prepared by the Committee, and recommended its purchase by the companies. Mr. Mudge, in moving the adoption of the report, said that a very full report had been given by the Committee at the last convention, and that the report just given was a continuation of that report. He thought if the meter with the maximum demand attachment could be made cheaper it would come more into use. Mr. Pratt seconded the adoption of the report and said he thought the Committee, and especially Mr. Webber, ought to be commended for the work they had done. Mr. Pack thought that maximum demand meters would come more into use for comparatively small installation, and he thought it would be necessary for the manufacturers to produce a meter which would be fairly accurate at a very low cost or it would mean that the companies would be handicapped. Mr. Lamb, of Ottawa, said he thought if the buyer demanded great accuracy the cost would have to be large, but if a slightly less accurate meter would fill the conditions the manufacturers could produce a meter at a less price.

The president then read a communication from F. A. Cote of Sorel, Quebec, stating that he had perfected a load controller which was reliable and of very simple construction at a comparatively low cost.

In answer to a question by the president, Mr. Webber said he thought a meter would cost something like $50 from 80 to 100 amperes, and if a meter could be made, say a 25-ampere meter, for $10 or $15 less it would be satisfactory.

Mr. Lamb, of Ottawa, replying to a question of Mr. McLachlan expressing a doubt that the limit set by the government would make it possible to lower the price, said that the government limits were very wide and that the consumers' demands really fixed the price.

After some further discussion the report was adopted.

The report of the Commercial Committee was given by T. F. Kelly, the chairman of the Committee. He outlined what the Committee had been doing and the information they had got. The Committee had sent out a number of questions such as, "Have you electrical competition," "Have you gas competition," "Do you maintain a separate department to secure new business," "Do you advertise," "Does your company do inside wiring." He gave a summary of the answers received to these questions, and stated that the work of the Committee should be continued.

An interesting discussion followed in which P. H. Kemble, of Toronto, J. G. Henninger, of Cleveland, Mr. McDougall, Mr. McDunnough, Mr. McLachlan and Mr. Pratt took part.

The Secretary read the communications, after which the convention adjourned to meet at 2 p. m.

Afternoon Session.

The president called the afternoon meeting to order at two o'clock, and called on Prof. H. T. Barnes, of McGill University, Montreal, for his paper on "The Influence of Ice on Water-Power Development."

Ice and Water Power.

Dr. Barnes replied, previous to giving his paper, that he deeply appreciat-

ed the honor of being invited to give a paper at this convention, and hoped that any information he might impart would be of some service to those in charge of power plants.

Professor Barnes describes the physical characteristics of ice formation of several different natures such as surface ice, frazil ice, anchor ice, and the relation of power-house location to formations of these characters. He gives the following rules in general for the avoiding of ice troubles: (1) Have covered racks and steam heat provided for the trouble which always comes to a power house before the permanent ice forms. (2) Install a few meteorological instruments to watch the weather in order to be prepared for the first cold snap. (3) Where the forebay is fed from a lake or canal, induce freezing as soon as possible, otherwise maintain an open channel down to the power house. Provide a special way for the floating frazil. (4) Watch the temperature of the water at the outset of cold weather, and when 32 degrees Fahrenheit is approached have the steam-heating plant in readiness.

With the assistance of a number of limelight views Professor Barnes endeavored to show the effect of the sunlight, wind and rain upon ice. The views included some which had been taken of ice formation in the River St. Lawrence, the Lachine Canal, and on the River Neva in Russia, where experiments had been taking place for some time. The workings of a thermometer which he had endeavored to perfect were fully explained and by means of this thermometer the proximity of ice in an open body of water is detected.

The discussion on the paper was opened by John Murphy who had some slides thrown on the canvas showing the formation of ice at Niagara Falls and different points, and also illustrating the construction at different power plants of ice racks with steam heating appliances. Mr. Murphy said that he had read an article by Dr. Barnes some years ago in which it was stated that the temperature varied from 32.001 to 31.999. His observations in this respect had given a temperature of 32.

This discussion was exceedingly interesting and was participated in by W. L. Bird, R. B. McDunnough, P. H. Kemble, W. H. Munro, Mr. Pratt, G. G. Gale, and J. J. O'Donnell.

At the close of the discussion Dr. Barnes expressed his appreciation for the interest taken in his paper and was glad to have been able to have given any information that might prove helpful.

The president expressed his pleasure at having Professor Barnes present, and the thanks of the members, for the interesting and instructive paper were given by a hearty round of applause.

I. G. Henninger then illustrated his paper on "Recent Developments in Lamps and Reflectors," by the aid of lantern views and showed some of the results obtained from reflectors and indirect illumination.

This paper describes in a general way the great advance which has been made in the manufacture of incandescent lamps, and in their proper application to industrial and residence illumination in connection with reflectors of modern design.

Owing to ill health R. G. Black was unable to be present and the secretary was requested to send a cablegram to him on the Continent extending the good will and greetings of the Association.

As the hour was late the discussion of Mr. Henninger's paper was postponed until the following morning.

Dinner and Garden Party.

At 7:45 p. m. special electric cars left Chateau Laurier for Victoria Hotel, Aylmer, where an informal dance and garden party tendered by the City of Ottawa was held. There was a good attendance of the members and ladies and a very pleasant time was spent.

Morning Session.

At the morning meeting of the convention the discussion of Mr. Henninger's paper, which was read the previous morning, was opened.

Mr. McDunnough said that he believed the paper would prove especially helpful to the managers of small central stations where the manager has to attend personally to so many of the details of the business, and would be useful in assisting them in using their influence to induce the customers to purchase the proper lamps, in order to attain good results.

T. F. Kelly, of Hamilton, described the method which had been employed in that city and added that inviting merchants and manufacturers to attend lectures given by illuminating engineers had worked well.

Mr. MacLachlan asked whether anything could be done to get rid of the ultra violet in the light, and in replying to this question P. H. Kemble said he thought this might be done away with by applying a solution of potassium bichromate.

Distribution System.

The next paper to be read was that of S. Bingham Hood of the Toronto Electric Light Company, under the heading of "The Construction of Distribution Systems for Outlying Districts and Smaller plants."

In this paper Mr. Hood presents a veritable treatise describing in turn the building and maintenance of the pole line, the pole-line accessories, the primary and secondary distribution, the characteristics of the circuit, and the lay-out of the secondary network.

The paper which proved very interesting and useful aroused considerable comment and discussion. All the members seemed heartily agreed that having joint poles was by far the better method, not only from the standpoint of the appearance of the streets, but from the economical viewpoint.

F. T. Stocking, in discussing the paper said, that he considered exception might be taken to some of the statements, and spoke of eastern poles being better than western ones in suburban work. He thought that the remarks with reference to the concrete poles were correct; and that the treatment of cross arms with a good preservative was a splendid investment.

A. L. Mudge considered that the paper was too strongly in favor of 25-cycle lighting and said he thought that a higher cycle was a great deal better.

The president congratulated Mr. Hood on his very useful paper and said that he considered it would be of great assistance to the members of the Association.

Executive Session—Election of Officers.

The meeting of the executive was held at half past two, and the report of the Nominating Committee was received and approved of.

The following officers were elected for the incoming year:

President, R. F. Pack.
1st vice-president, W. L. Bird.
2nd vice-president, R. H. Sperling.
3rd vice-president, J. S. Norris.
Honorary secretary, T. S. Young.

Managing Committee: A. A. Dion, W. C. Hawkins, A. L. Mudge, H. G. Matthews, W. L. Adams, F. A. Chisholm, I. H. Wright, D. R. Street, P. H. Kemble, Willis MacLachlan, D. H. McDougal, E. L. Milliken, H. B. McDunnough, W. Phillips.

A telegram was received from Samuel Insull, of Chicago, regretting that he was unable to attend the Convention and expressing the hope that it would be a great success.

In the evening a very successful banquet was tendered by the Local Committee in the banquet hall of the Chateau Laurier.

Morning Session.

The first order of business on opening the meeting on the morning of June 21 was the reading of a paper by C. W. Baker of the Canadian Westinghouse Company at "Watt-hour Meters—Past and Present."

Mr. Baker traces the development of the invention and discovery which led up to the design of the early watt-hour meter and in turn describes the principles upon which the meter models of later design are based.

A lengthy discussion took place on the paper, which was considered a very important one. Some difference of opinion was expressed as to the re-

spective merits of ball bearing and pivot bearing meters, Mr. Webber pointing out that according to the tests there did not seem to be very much advantage in either one.

H. S. Brown pointed out that there seemed to be some differences of opinion among the designers of meters with regard to mechanical features, such as registers, some designers placing the worm gear reduction at the shaft, while others put it at the third or fourth position in the reduction. Another point was as to the use of steel spindles. Some engineers thought the low initial friction was not as important as some other conditions. He thought that the ball bearing offered some advantages over the ordinary pivot bearing.

A. B. Lambe, of the Inland Revenue Department, contributed to the discussion and spoke of the work the department was trying to do in this regard. He said the department with which he was connected, while trying to be fair to the manufacturers, was trying to get some of the parts of the meters standardized as he thought this would be of great advantage to both the companies and the customers. Mr. Lambe expressed his disapproval of the type of polyphase meter for balanced circuits coming from Europe, although he believed they worked under certain conditions.

Mr. Webber expressed his pleasure in listening to such an interesting paper and hearing the discussion upon it. He thought it was very valuable for the central-station men particularly. It was a great advantage, he said, to be able to listen to a manufacturer and hear at first hand of the improvements which were being made. It was of great assistance to the central-station men in deciding on the style of meter they ought to get. He complimented the manufacturers in having produced such an excellent meter as they had, one which was not even dreamed of a few years ago. As to the ampere-hour meter, the central-station men had been trying to do away with this style of meter for some time, and he was glad it was not now legal in Canada.

The president complimented the writer of the paper, and said that it undoubtedly was very beneficial for the manufacturers, the central-station man and the government to confer together.

R. Hornby from England was listened to with great interest when he described the different phases of the meter question in the old countries.

H. H. Stannard attended in the place of G. M. Gest who was to have given a paper on "Underground Construction." Mr. Stannard introduced the subject by referring to the large mileage of the pipe line of the Standard Oil Company, and also the conduits of the Bell Telephone Company, and stated that this indicated what no doubt would take place in the future as to all wiring.

Mr. Stannard then had thrown on the screen moving pictures showing the construction of conduits and the laying of cables in all their details.

The next item of business was the reading of a paper on "Commercial Electric Heating," by McAllaster Moore, of Belleville.

In the discussion some doubt was expressed as to whether the electric heater referred to in the paper was an advantage considering the low price of gas. There was considerable difference of opinion on this point, but all agreed that this subject was coming to the front and would receive more attention in the future. Mr. Kemble thought that it might be profitable for the company to work up this business as it would mean they would take current during the night hours. It was also suggested that in the cooking of meat and such like the substance was preserved much more than with cooking by gas, and this was thought to be a very important matter.

Mr. Moore in closing the discussion said that he had personally experimented with the heater and had found it to work satisfactorily.

New Business.

Thomas F. Kelly, of Hamilton, then read his paper on "New Business."

Mr. Kelly believes that the duty of the new business department should be not only to secure business, but to retain it. He believes this to be essential for the success of the business. The man at the head of the department and his subordinates should be entirely familiar with the class of business they are endeavoring to secure, with the territory they are supposed to cover, and to be acquainted with what has happened and what will happen in that territory. Special care should be taken that all inquiries for service in the different solicitors' territories should be turned over to them as soon as received, and the telephone number of the inquirer should be obtained if possible to enable the solicitor to get in touch with the prospect and make an appointment. He believes that more soliciting is required to get residence lighting business in Canada than in the United States. In Canada the landlord has not been educated to fit up the house or apartment with fixtures, and this must be handled by the householder. He favors soliciting the business and turning the installation and selling of fixtures and wiring over to a reliable contractor. In the event of the original customer moving he advises leaving post cards in prominent places in the empty house when the meter is removed so that the new tenant will have no difficulty in communicating with the office. He also suggests the use of key tags with suitable advertisements on them for distribution among the real estate men of the city.

This paper provoked a lively discussion by a number of those present, and much appreciation was shown for the manner in which the subject had been presented.

Afternoon Session

The first business of the afternoon was the paper entitled "Power Factor—Its Influence and Effect," which was read by D. H. Ross, of the Wagner Electric Manufacturing Company.

Mr. Ross believes that not enough attention has been paid to the importance of high power-factor and the necessity for including it as a basis of rates which will be fair not only to the operating company, but to many classes of consumer as well. The recent invention of unity power-factor motors has turned the attention of operating companies to the possibilities of saving in cost of service, reduction in overhead charges, etc., through the improvement of the power-factor of their systems. An analysis of these matters indicates an intimate relation between power factor and the cost of service. He, therefore, raises the question as to whether all rates schedules should not contain a power-factor clause which would require the customers with the low power factor to pay for the increased loss and investment which follow.

All agreed that this was a most valuable contribution to the literature of the society and a subject which should be taken into serious consideration and carefully investigated, it being of importance not only to the central-station but to the consumer or customer as well.

The president then called for the report of the "Committee on Rates and Forms of Contract," which was read by the chairman, Mr. Kemble, the President complimenting the committee on their excellent work.

The report on Uniform Accounting was read by Mr. Dion.

Baseball.

A baseball match took place between the manufacturers and the operating companies in the afternoon, and a smoker was held in the evening. All agreed that this had been the most successful convention of the many successful conventions held by the Association.

Marconi Company Takes Over United Wireless.

The Marconi Wireless Telegraph Company of America has taken over the title and actual management of the properties and assets of the United Wireless Telegraph Company.

According to Vice-President Bottomley of the Marconi company, the decision of the United States Circuit Court denying the injunction sought by the National Electric Signaling Company against the United Wireless Telegraph Company for alleged infringement of the Fessenden patents will mean a large saving to the Marconi Company. Mr. Bottomley also said that the acquisition of the United Wireless properties will mean a net gain of several hundred thousand dollars a year to the Marconi Company.

MICHIGAN SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION.

Convention Aboard Majestic, June 21-24.

With 102 members and guests of the Michigan Section, National Electric Light Association aboard, the steamer *Majestic* sailed from Port Huron, Mich., Friday, June 21, at 1:30 p. m., on a four-day convention cruise to Georgian Bay and northern ports. This was the second cruise of the Michigan Association, but the first meeting since becoming affiliated with the National Electric Light Association as a geographical section. Sailing northward across Lake Huron to Georgian Bay, Penetang, the first port of call, was reached at 2 p. m. Saturday. Here the steamer *Waubic* was waiting to convey the party through the famed 30,000 islands. At 7:30 p. m. Parry Sound was reached where arrangements had been made with the Hotel Belvidere to serve supper. The climb up the cliff to the magnificent spot upon which this hotel is located was one of the very enjoyable features of the trip, except to the portly, and was second only to the meal which followed. Leaving Parry Sound on the *Majestic* at midnight the course through the north channel was taken to Sault Ste. Marie, this point being reached at about 9 p. m. Sunday. Here the party was divided, some visiting the electrically operated Canadian locks, some the rapids, while another party inspected the steel mills.

Leaving the Soo at midnight Sunday, Mackinac Island was reached at 9 a. m. Monday where ample time was allowed to explore this interesting point so often called the "Gem of the Great Lakes." Several parties were formed to drive around the island while others preferred to walk. At 2 p. m. Monday the homeward trip began, Port Huron being reached at 2 p. m. Tuesday.

During the entire trip delightful weather was encountered and the cruise will long be remembered as one of the most interesting, enjoyable and profitable meetings of Michigan electrical men. Herbert Silvester, secretary of the Section, is deserving of great credit for the manner in which he arranged every detail and the success of the trip is, in a large measure, due to his efforts.

The trip was not all given over to pleasure, four business sessions being held. The first meeting was called to order by Pres. R. W. Hemphill, of Ann Arbor, Friday afternoon. After a brief address of welcome by E. W. Holden, a representative of the Northern Navigation Company, the annual presidential address was delivered by Mr. Hemphill.

Mr. Hemphill referred to the work of the Executive Committee which led to the affiliation with the National Association last January; also to the campaign conducted for new members. He spoke of the volume of business devolving on the secretary and recommended that a permanent, paid secretary be employed. Speaking of central-station conditions in Michigan he said that in the state, having a population of 2,810,173, there are 291 central stations serving a population of about 2,020,426. Included in this number are 123 municipal plants in cities and villages of 946,284 population, but 17 of these only operate street-lighting systems in cities of 784,463 population. Included in this last class are the cities of Detroit, Grand Rapids, Bay City and Kalamazoo. The characterization of the development of the electrical industry in Michigan, during the past year, Mr. Hemphill said is in elimination of the small municipal plant and the consolidation of the smaller central stations into great, strong systems, thus assuring stability of operation, reliability of service and economical management. In conclusion he spoke of the importance of considering the subject of employees' welfare.

A Nominating Committee composed of John A. Cavanaugh, of Benton Harbor, F. B. Drees, of Lansing, and H. A. Fee, of Adrian, was then appointed to report on Tuesday. At this time it was also decided to send a telegram of greetings to the Canadian Electrical Association in annual convention at Ottawa, mentioning the fact that the Michigan Section was cruising on a Canadian vessel on Canadian waters.

The report of the Committee on Rates was then called for. This Committee, through J. V. Oxtoby, of Detroit, simply reported the work that is being done by the Michigan Railroad Commission. This Commission is taking up the study of Rate Schedules and Uniform Accounting for Central Stations and has been working in conjunction with two committees of central-station men on these subjects. At present the work of the Rate Committee is confined to adopting a standard form of blank upon which companies will be requested to report the schedule of rates in use. Adjournment was then taken until Saturday morning.

Saturday's session was opened with the paper on "Contract Routine," by Roy T. Duncan, of Detroit, which was read by the secretary. This paper calls attention to the necessity for prompt service in connecting new business and advocates the multiple system of issuing orders wherein several copies of an order are made and each department furnished a copy at the same time. The details of contract-order routine as applied by the Detroit company were described and illustrations shown of the various forms used.

H. A. Fee, of Adrian, asked as to the policy of companies in demanding deposits from new customers. Herbert Silvester, of Detroit, stated that the Detroit company formerly demanded the guarantee of a property owner or a deposit equivalent to the customer's first two months' bills. This practice has now been discontinued and no deposits are asked from residence customers. All deposits are being refunded to those who have been taking service for two years or more. The experience of the Detroit company has been that the interest due customers on deposits made has been greater than the cost of collecting bills.

President Hemphill stated that the larger companies were abolishing the practice of asking for deposits with the result that business otherwise impossible has been obtained with very little loss.

D. B. South, of Detroit, thought there should be no question as to the advisability of taking on residence business without guarantee. C. F. Stirling, of Three Rivers, added that the policy of asking for deposits causes the public to harbor a feeling of dissatisfaction toward the company.

The second paper of the meeting on "Recent Legal Decisions Relating to Public Utility Companies" was presented by James V. Oxtoby, of Detroit. The decisions discussed in this paper are (a) the decision of the Michigan Supreme Court in the case of the Citizens' Telephone Company, of Holland; (b) the decision of the United States Supreme Court in the Goodrich White Star Line cases and (c) the decision of the Michigan Supreme Court and the Michigan Railroad Commission in the Peninsular Power Company case. These decisions are discussed under the headings: status of outstanding contracts made by a public-utility company; rights and status of an electric company engaged in an interstate business.

H. E. Drees, of Lansing, opened the discussion calling attention to the necessity of segregating the various departments of a central station. This will simplify the work necessary to file rate schedules for the Commission.

R. M. Hemphill, of Ann Arbor, thought that it will be necessary for all companies engaged in interior wiring to form separate construction companies to do this work in the future.

D. B. South, of Detroit, referred to a municipal plant in Michigan charging a flat rate of seven cents per kilowatt-hour for all business. He said the plant claims it makes a profit and asked what attitude the Commission would take in this case when comparing the seven-cent flat rate with the differential rate charged by most companies.

Mr. Oxtoby said that the question of rates is one of policy and would be considered as such by the Commission. On the basis of cost the differential rate is an ideal one. He also said meter rates were legal.

H. A. Fee, of Adrian, thought the

Commission should determine at some standard method of arriving at rates which could be used by all central stations to meet their requirements.

The paper by Calvert M. Wardwell, Ann Arbor, entitled "Load-Factor, Diversity-Factor and Power-Factor" was next presented. This paper defined load-factor and gave numerous examples of its effect on the central station. It is stated that by showing power consumers they may secure cheaper power by changing their hours of use for a few months of the year it is often possible to secure power on off-peak time at a profit both to the producer and consumer. The effect of the diversity-factor on the central-station system was discussed and figures presented showing that the central station is not justified in taking the customer's maximum demand in estimating his reserve station capacity, but should know in which class he belongs and the diversity-factor of that particular class. Summarizing, the paper points out first, that load-factor controls revenue; second, the higher the load-factor the greater the revenue of capital invested; third, good power-factor allows the use of the full capacity of generators, line and transformers, and consequently increases the revenue; fourth, diversity-factor controls the station investment; fifth, that these three factors absolutely control the earning capacity of every dollar invested.

A brief discussion as to whether or not the small residence customer was a profitable one followed. R. S. Stewart thought that in most instances the short-hour user was not a profitable customer. John Cavanaugh thought that such a customer could be a profitable or a very unprofitable one, depending upon the time he uses service.

Herbert Silvester stated that load-factor of a station could be improved by offering off-peak rates to factories and other industrial establishments.

The next paper, by A. B. Hoffman, of the Wagner Electric Manufacturing Company, entitled "Some New Current-Consuming Devices of Interest to Central Stations," was then presented. This paper was very complete, describing in detail the construction, operation and advantages of the single-phase rotary converter and the single-phase mechanical rectifier. A portion of the paper was devoted to a discussion of power-factor, emphasizing the importance of maintaining the power-factor of central-station systems at as near unity or 100 per cent power-factor as possible. Attention was called to the rate schedule of the Cleveland Electric Illuminating Company and the effect that power-factor has on these rates.

As there was no discussion the next paper on the subject of Electricity for the Farm was presented by George D. Slaymaker. This paper was divided into two parts, the first entitled "Central-Station Service in Rural Districts," and the second, "A Farmer's Estimate of Electricity." Part 1 contains operating experiences of the Eastern Michigan Edison Company in supplying farmers with energy for lighting and power, and gives detailed costs on four extensions, enumerating all conditions. Part 2 consists mainly of a description of the installation at the Cloverdale Farm, located at Rochester, Mich.

C. F. Stirling, of Three Rivers, thought that at present farmers' business was only profitable if it could be obtained along existing lines. In Three Rivers two customers are being served from a 6,600-volt line. The minimum rate is $1.50 per month and the yearly income is $24. Both installations are for lighting only, although motors are at present being installed.

The final business session of the convention was held on Monday evening. The first business taken up was a paper and demonstration on "Fuel Analysis and Boiler-Room Economies," by Norman G. Reinicker, of Detroit. Mr. Reinicker described in detail the methods that the Detroit Edison Company are adopting to improve the efficiency and economy of the steam-generating plant. Methods of analyzing flue gases were described and an actual demonstration made of the operation of an Orsat portable testing apparatus. Regarding coal analysis, Mr. Reinicker thought that satisfactory results could only be obtained by having this work done by chemists.

Herbert Silvester advised that the Association take action on the recommendation made at the last convention that means be provided for testing coal from all plants represented by the Association.

This paper was followed by an illustrated lecture by D. M. Diggs on "Ornamental Street Lighting." The speaker reviewed the early progress of lighting from the times of torches, candles, kerosene lamps, etc., to the present day. Various types of illuminants at present available for street lighting were discussed briefly and performance curves shown. The luminous arc lamp as adopted in New Haven, Conn., Rochester, N. Y., and more recently at Baltimore, was strongly recommended for street-lighting purposes, supported on an ornamental post. Various views showing the appearance of such an installation were shown.

H. A. Fee called attention to the necessity of considering silhouette in laying out street lighting installations. He asked Mr. Diggs what the relative advantages of tungsten curb lights and lamps suspended in the center of the street were. Mr. Diggs thought that either system could be used with satisfaction, the objection to the curb system being greatly eliminated by the fact that they are usually inclosed in thick opalescent globes. However, the lamps in such a system, he said, should be sufficiently high to be out of the range of vision. In reply to a question as to installation cost for luminous arc lamps, Mr. Diggs said that in Baltimore this system is being installed at a cost of $1.20 per front foot. In New Haven the cost is $3.00 per front foot. He said that no exhaustive figures were available, due to the peculiar conditons which obtain in all three of the cities in which this system is installed.

The final paper of the session was entitled "Some Experiences in Operating Small Plants," by Robert S. Stewart. This paper describes rather fully the conditions that obtained in an unprogressive plant and the change that was made by the adoption of approved methods. This paper will be printed in a later issue.

On Tuesday morning an executive session was held at which the following officers were elected:

President, H. E. Drees, Lansing.

Vice-president, C. F. Stirling, Three Rivers.

Secretary-treasurer, Herbert Silvester, Detroit.

The new Executive Committee is composed of Messrs. Hemphill, Fee, Marshall, Spencer and Chandler.

The recommendation made by President Hemphill in his address to the effect that the Secretary's position be made permanent and compensation given for services was approved by the Executive Committee.

Convention Notes.

Through the courtesy of the Northern Navigation Company each member of the party was presented with a gold-plated lapel pin inscribed with the trade mark of the company.

At Parry Sound the General Electric Company engaged the Lyric Theater, where a very enjoyable moving-picture play entitled "Every Husband's Opportunity" was produced. The party attended the performance in a body.

No less than 30 cameras were counted at the start of the trip and the ladies were kept busy posing when other attractive scenery was beyond range of the lens.

Several of the delegates residing in the northern section of the state left the boat at Sault Ste. Marie and Macinac Island for their homes.

Robert Stuart Stewart, as the "Dear Old Flag," the official human emblem of the Patriotic and Historic Society, was the recipient of approximately 278 official

salutes during the voyage, at the hands of his fellow members.

During the course of the first meal aboard the *Majestic,* President Hemphill presented each lady with a bouquet of peonies. Mr. Hemphill is a bachelor.

F. Bissel, of the Bissel Company, Toledo, Ohio, was occupied during a considerable portion of the journey in demonstrating his electric vacuum cleaner and sewing-machine motor.

The Board of Trade at Parry Sound prepared a folder containing a panoramic view of the town and a map of the route of the *Majestic,* which was distributed to each member of the party.

The devotees of the P. G. adjourned Sunday afternoon to attend the song service which was led by Carl Mann, of Detroit.

A round of applause greeted each waiter as he appeared from the pantry laden with edibles. This was a continuous ovation. Among other things, ozone stimulates the appetite.

Electrical Equipment of the New Post Office in New York.

The new post office, being erected in New York City, one of the finest buildings of its kind in the world, will have an approximate connected lighting load of 883 kilowatts, using three-wire distribution, and an approximate power load of 1,000 horsepower, says the New York *Edison Weekly.* The following data have been kindly furnished by the consulting engineers, Marks and Woodwell.

There are to be 20 electric elevators in the building. Of this number, which are of the worm-gear traction type of Otis manufacture, 5 are designed for passenger service, 14 for combined passenger and freight service and 1 for freight service only. The elevator equipment complete aggregates a total of 590 horsepower in motors.

The heating will be effected by means of a hot-water forced-circulation system of direct radiation. A complete system of mechanical ventilation will deliver tempered fresh air to all parts of the building and remove the vitiated air. This mechanical ventilation is to be supplemented by certain indirect heating, which will involve the use of motor-driven hot-blast fans. All the heating and ventilating apparatus will utilize direct-current 240-volt motors ranging from one-eighth to 45 horsepower, the total amount being 219 horsepower. This will operate in all 20 fans and 6 centrifugal pumps.

The building is also to be equipped with duplicate house pumps for delivering water to the storage tanks in the superattic, and a circulation pump for domestic hot-water service. A complete vacuum-cleaner system is also being installed, which includes 2 vacuum producers, each driven by a 50-horsepower motor.

The heavy steel doors to the shafts of the freight service elevators and in the vestibules along the mailing platform are to be operated by pneumatic engines, the air being furnished by 2 compressors, each direct-connected to a 15-horsepower motor.

About 60 motors in all will be included in the motor equipment of the building, a total of 941 horsepower being represented. This does not include, however, the motors required for the proposed mail-handling apparatus, which will be 20 in number, aggregating about 100 horsepower, and the motors to be connected to the pneumatic-tube service for the transmission of mail.

The consulting engineers state that the lighting of the building has been planned along conventional lines. The work has been let out to the Tucker Electrical Construction Company, which is now engaged in the installation of the service conduits. There is a long run of 150 feet between the street curb and the service board in the switchboard room.

The building, which is of the Corinthian style of architecture, is approximately 375 feet long on the Eighth Avenue side, and extends 335 feet toward Ninth Avenue between Thirty-first and Thirty-third Streets. It is five stories high, including the basement, and faced with white marble.

Aluminum Conductors.

Although aluminum conductors are now in such general use, it would appear that engineers do not fully appreciate that the only tangible effect resulting from their demand for specifications for aluminum conductors that require the maximum possible conductivity and elastic limit mechanically obtainable, is to limit competition, which, it will be allowed, from the viewpoint of the consumer, is a most undesirable feature.

It is possible to produce aluminum conductors having electrical conductive powers of 61 per cent (as compared to hard copper, 97 per cent) with an elastic limit of 15,000 pounds per square inch; but the manufacturer undertaking to supply a large quantity of conductor to meet such specifications is facing a certain possibility of having a large portion if not the greater part, of the material rejected.

Results obtained from tests made on conductors which were installed on guarantees of 61 per cent conductivity have in no case fulfilled the requirements, the tests showing an average conductivity of 60.65 per cent. What is the explanation of this material having been accepted? Apparently the engineers calling for the conductors have thought that the manufacturer who undertakes the impossible is likely to obtain the higher results, although he does not meet the required specification. Their supposition may possibly be correct, but one would hardly consider that the manufacturers were obtaining "fair play." Surely the manufacturer that is prepared to guarantee 60 per cent and delivers 60.5 per cent is entitled to as much consideration, if not more, than the one who guarantees 61 per cent and only delivers 60.5 per cent. Would it not be well for the electrical world in general to standardize the conductivity and elastic limit of aluminum conductors practically obtainable?

A well-known engineering firm, of New York City, recently compiled specifications for a large quantity of aluminum conductor. The specifications called for conductivity of 60 per cent, with a tensile strength of 25,000 pounds per square inch and were based upon the results obtained from tests made on samples taken from a large number of high power transmission lines in the United States. Is this not the surest proof of the results practically obtainable from aluminum electrical conductor?—*Electrical News.*

The Electrical Blue Book.

The 1912 Electrical Blue Book is a handsome publication of 206 pages, containing a comprehensive exhibit of officially approved electrical supplies, to which is added an illustrated list of other representative lines of electrical material. A feature which makes this book especially valuable to every user of electrical material is the National Electrical Code, the rules and requirements of the National Board of Fire Underwriters for electrical wiring and apparatus as recommended by the National Fire Protection Association. The Code rules are explained in detail and the many illustrations bring out in a most understandable manner the correct interpretation of the installation rules. A complete index makes each rule and section easily discovered. The list of approved fittings is thoroughly comprehensive and is brought up to May 1, 1912. The illustrated exhibits of the manufacturers of electrical material, together with the other essentially valuable contents of this publication, make it of unique value to the buyer of electrical apparatus and supplies. The book measures 9 by 12 inches, is bound in substantial stiff cloth covers and will undoubtedly be preserved and used as a convenient book of reference by all recipients. Each book is carefully packed in a strong paper carton. Supplied by the Electrical Review Publishing Company, Chicago, at $2.00 per copy.

A mail tube line, 7.5 feet in diameter, is to be constructed in London by the British Post Office. Each vehicle will be operated by an individual electric motor.

A Plea for Electric Cooking.

Right in the heart of "Shakespeare's England"—the new Exhibition at Earl's Court, London—will be found one of the latest applications of electricity to the comfort and health of man.

It is worth while going to Earl's Court to see this restaurant alone. For the first time in the history of this country a large restaurant exhibits the cooking of food by electricity in the open view of the public. The cooking apparatus is ranged along one side of the restaurant, and any one may watch every process—roasting, baking, frying, grilling, boiling, and stewing—going on in full view.

Not only can the public test the excellent results from electric cooking, but they can see how clean and convenient and accurate the processes of electric cooking are.

Every factory has a staff, and every staff has a dinner hour. In many factories arrangements are made by the firm for catering, or for warming or cooking the food brought by employees. This is where electricity comes in.

A few years ago the idea of using electricity for cooking, on anything but a luxurious basis, would have appeared absurd. We have, however, advanced at a rapid pace. In London today there is a large workshop kitchen where dinners (joint, two vegetables and sweets) are electrically cooked and supplied at eight cents per head.

This was a contract job, in the sense that the installers of the apparatus had to guarantee that the cost of cooking the dinners should not be more than so much per head.

What has brought electric cooking so quickly down to the commercial level? Partly the decrease in the cost of current, but mainly the improvement in the efficiency and reliability of the apparatus. The electric oven has not quite got to the pitch of hardiness of the electric motor, but it is approaching it rapidly.

Most users of power "on tap" can get current for cooking purposes very cheaply. Sometimes they may arrange to take it during the slack hours, so as to level up the demand. It is not very simple to "store" electricity in accumulators, but it is quite simple to store it in the form of heat in ovens.

Three reasons may be given for using electric cooking in the factory mess-rooms. First of all, the electric cookers—like electric motors—may be placed anywhere convenient. There is no need to build chimneys or flues, or to transform part of the factory buildings into a kind of stoke-hold. All that is required is a range of electric ovens in a corner of the mess-room. Except where frying has to be done, the ordinary ventilation is generally quite sufficient. If any help is needed, it is to take away the ordinary smell of cooking. There are no unpleasant fumes; there is no smoke; and there is so little heat *dissipated* that roasting and baking can be carried on during the hottest summer day with astonishing comfort.

The Perfection of Electric Cooking.

The second reason is that the results, from the culinary point of view, are so admirable. There is no cooking like electric cooking. No one who has ever tasted electrically cooked food will ever want to live upon any other.

Here a question of health comes in. Good food, well cooked and appetizing in appearance, does more good to the eater than indifferent food which lacks the power of temptation. The efficiency of work-people depends upon their health; therefore electric cooking means efficiency.

The third reason is allied to the second. Electric cooking is the *easiest* as well as the most accurate means of cooking. Ordinary cooking is a kind of hit-or-miss business. Sometimes the cook has the oven just right and takes out the dishes at the precise moment of perfection; but generally she is only there or thereabouts.

With electric cooking there is no such uncertainty. With electric cooking, indeed, there will be no bad cooks. The temperature of an electric oven or cooker is under such perfect control that any cook who has enough brain to tell the time by the clock can cook accurately. The "electric cook" cooks by the clock. The current is switched on for so long; then the dish is placed in the oven; then or later the current is regulated by a simple switch; and at a certain hour the oven is opened and a perfectly cooked dish is available.

Electric Cooking in the Factory.

Every user of an electric motor knows that it would be worth using even if the actual cost of energy per horsepower were greater than for other sources of power. That is because the incidental advantages—the convenience, saving of space, absence of nuisance, and the perfection of control—are so great as to be well worth paying for.

Similarly with electric cooking. Tests show that the bare cost of cooking by electricity is roughly the same as by gas, at the usual prices. But that is only the beginning of the story. Electrically cooked joints, for instance, shrink far less than joints cooked by other means.

Now that a definite start has been made with electric cooking on a large scale, we may look forward to it becoming more and more common until it takes its place along with electric lighting and electric power as part of the regular equipment of up-to-date factories.—*Electrics.*

BOOK REVIEWS.

"Direct and Alternating-Current Manual." By Frederick Bedell, assisted by Clarence A. Pierce. Second and enlarged edition. New York: D. Van Nostrand Company. Cloth, 360 pages (8½ x 5½ inches), 144 diagrams. Supplied by the Electrical Review Publishing Company for $2.00.

In this, the second edition, there has been added to the contents of the first edition an extension of 100 pages, the additional matter dealing with the induction motor, induction generator, synchronous motor, synchronous converter, wave analysis and problems. In harmony with the previous edition the author does not give extended directions for the performances of experiments, but gives a brief discussion of principles which are necessary for the understanding of the operating characteristics of the apparatus. In this respect the work is very commendable. If, however, the text is to be used as a laboratory manual by students who have had a good course in the theory of alternating currents and alternating-current machinery, much of the matter of the text will be mere repetition.

In the opinion of the reviewer the purpose of laboratory work is twofold: to illustrate, and to give the student a realizing sense of fundamental principles and phenomena; and to develop self reliance and originality. A manual well adapted for acquainting a student with fundamentals and to give him a clear understanding of these should contain more detailed information concerning the manner of conducting the experiment. The laboratory work should be supplemented by recitations upon the theory of the experiments and the work actually done. In this way the student is brought to a clearer understanding of the significance of the exercise.

For this supplemental work, and for developing originality, self reliance and for giving the student an insight into research, this manual is excellent and can not be recommended too highly. The suggestive problems in the last chapter will aid greatly in this work.

The chapter on wave analysis will be found very useful, not only by college students, but by any one who may have occasion to analyze alternating-current curves. The explanations are clear and the principles can easily be mastered.

The aim of the author to produce a textbook which will aid in the development of individualism and stimulate initiative, has, in a large degree, been fulfilled. All the discussions are marked by clearness, conciseness and accuracy. If not used as a text, it will, at least, be found very useful as a reference book by every instructor in laboratory courses in electrical engineering.

C. M. JANSKY.

"The Kingdom of Dust," By J. Gordon Ogden. Chicago: Popular Mechanics Company. Cloth, 116 pages (6½ x 4½ inches), illustrated. Supplied by the Electrical Review Publishing Company for fifty cents.

This little volume, which is written in popular style, will be a revelation to many readers as to the all-prevalence and great importance to humanity of the tiny particles of matter which the author classifies as dust. The term is taken to include not only inert particles of solid matter but minute drops of liquid and the tiny organisms such as bacteria and other microbes. One chapter is devoted to cosmic dust which is supposed to make up the tails of comets and the nebulas so numerous in the heavens.

"The Signal Dictionary." Second edition, revised for the Railway Signal Association by A. D. Cloud and H. H. Simmons. New York and Chicago: Simmons-Boardman Publishing Company. Leather or cloth, 526 pages (12 x 9 inches), illustrated. For sale by Electrical Review Publishing Company for $6 (leather) or $3.50 (cloth).

The Railway Signal Association Signal Dictionary, first published in 1908, has been revised and published in the second edition (1911-12) under the supervision of a committee of the Association. The aim in revising the book, as stated in the preface, has been to "retain descriptions and illustrations of apparatus which, although no longer made, is and will remain for some time in rather extensive use, as well as to reflect the latest work of the manufacturers." That the book is not merely a catalog of manufacturers' devices is shown, however, by the fact that it contains practically all of the standards adopted by the Railway Signal Association and a great many standards of signal departments of prominent railways of this country and England. Another change which will be found almost as valuable as the addition of the up-to-date apparatus and standards is the rearrangement of the material in a form which is well adapted for ready reference. The descriptive part of the book is divided into five sections which are clearly marked by the title pages and subdivided so as to arrange each branch of the subject under distinct heads. The definition section has been amplified by the addition of a large number of the terms used in connection with the generation and distribution of alternating current. This part of the book contains reference to descriptions included in the descriptive part, and a cross-reference index is added. The divisions of the descriptive part are: (1) Signal Symbols and Signal Indications; (2) Block Signaling; (3) Interlocking; (4) Highway Crossing Signals, and (5) Accessories. The last named division contains 18 subdivisions in which the apparatus and devices used in railway signaling are illustrated and described.

"Outlines of Applied Optics." By P. G. Nutting. Philadelphia: P. Blakiston's Son & Company. Cloth, 234 pages (8 x 5 inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.

This volume covers a field which has been greatly neglected, overlapping as it does the customary books dealing with optical theory and those dealing with practical optics, and yet devoting itself mainly to the problems of optical measurements from the standpoint of the worker who is aiming to get the best results with the best instruments. An introduction is given dealing with the fundamental laws of optics and the important facts of the subject. Considerable space is given to the theory of the formation of images and practice in computation and designing of optical systems such as are used in telescopes and other instruments. The human eye receives attention in a chapter which considers this organ from the standpoint of its practical utility. Colorimetry, polarimetry, interferometry, radiometry, photometry, spectaphotometry all come in for consideration, as well as the physical properties and sensitometry of photographic plates. As indicated above, the field is somewhat unique and it is to be hoped that this will be followed by a more comprehensive volume dealing with the same subjects. It should find extended usefulness among practical workers in optical measurements. The typography is good, but the proof reading, especially in some cases of mathematical equations, is not as perfect as might be desired. The book also suffers from lack of an index. An excellent practice is followed by giving at the end of each chapter a list of references dealing with writers taken up in the text and to other treatises and articles dealing with the subject.

"Modern American Telephony." By Arthur Bessey Smith. Chicago: Frederick J. Drake & Company. Flexible leather, 790 pages (6⅞x4¼ inches) with 470 illustrations. Supplied by Electrical Review Publishing Company for $2.

This is a practical book covering the broad subject of telephony without going too deeply into technical and theoretical details. The first few of the 26 chapters are devoted to the elementary principles of sound and of the electrical circuit, especially those of import in telephony. After this introduction, which covers about an eighth of the book, the transmitter and receiver are described and the magneto system explained. Telephone batteries, power equipment and the common-battery system are then taken up. This is followed by a more detailed study of the magneto switchboard and of practical points to be observed in switchboard installation. Then follows a consideration of multiple switchboards and of central-energy exchange equipment. A description of test boards, testing apparatus and protective devices forms a prelude to two long chapters on measuring instruments and the location of telephone troubles. Practical hints are given for the construction of rural lines, overhead and underground circuits. One chapter is devoted to wireless telephony and the final one to the most important features of automatic telephony. A good feature of the book is that it describes typical forms of telephone apparatus and typical telephonic systems without giving substantially duplicated descriptions of the products of various manufacturers, as many telephone books do. The binding and typographical appearance of the book are good; many of the illustrations lack clearness, however. A table of contents is also desirable, since an attempt to insert it in the index detracts from the value of the latter as a reference finder. These slight defects do not materially detract from the undoubted merits of the book particularly for those connected with the construction, installation, wire chief's and trouble departments of a telephone company.

Street-Lighting Rates in Oakland.

Oakland, Cal., is to have a reduction in rates for street lighting during the next fiscal year, which will probably reduce its lighting bill by about $15,000 annually. The reduced rate is largely due to the competition between the Central Oakland Light & Power Company and the Pacific Gas & Electric Company, the latter receiving the contract, which it has carried for a number of years.

The new rates are as follows: 480-watt alternating-current arc lamps, $5.70 per month on the all-night schedule; $4.50 per month on the moonlight schedule, with additional time charged at 2.5 cents per hour. 300-watt direct-current luminous arcs, $6.00 per month on the all-night schedule and $5.00 per month on the moonlight schedule, with additional current at three cents per kilowatt-hour.

Electroliers containing three 75-watt, or four 40-watt, or four 50-watt tungsten lamps will cost $2.80 per month on the all-night schedule, or $1.70 per month on the moonlight schedule.

For the public buildings of the city, current for power purposes will be supplied at 1.8 cents per kilowatt-hour, and for lighting at 2.4 cents per kilowatt-hour.

New Electrical and Mechanical Appliances

The Trill Continuous-Card Engine Indicator.

One of the chief objections to the ordinary indicator is that it only shows what is happening for one cycle of an engine. If it is desired to watch the behavior of valves and governors on an engine operating on a variable load it is impossible to secure satisfactory data with an indicator which only records the operations of one out of every 5 to 25 strokes. It is evident that the average of every twenty-fifth stroke of an engine may be far different from the average of every stroke. Another objection to the ordinary indicator is the time and trouble incident to putting in a new card.

These difficulties are overcome in the Trill continuous-card indicator. A roll of paper is placed on a drum, the indicator started and a card will be given for every stroke of the engine without any further attention on the part of the engineer. This indicator is attached to the engine in the same manner as the ordinary indicator. The instrument shown in the illustration is provided with the "Faultless" reducing mechanism which gives a correct reducing motion, adapting the same indicator to operate on different engines having strokes of from 6 to 72 inches. This reducing motion is more convenient and is free from the faults common to the ordinary pantograph or swinging-arm reducer, neither of which gives an absolutely proportional reduction for every portion of the stroke.

After the indicator is in place on the engine, a roll of paper is placed on the smaller drum *D* and the free end threaded around the larger drum *E* on which the diagram is traced. In order to do away with the necessity of tracing a separate atmospheric line for every card, the second pencil *B* is provided, which is set at the atmospheric line given by the first pencil, after which the second pencil will trace a continuous atmospheric line on the total length of the indicator chart.

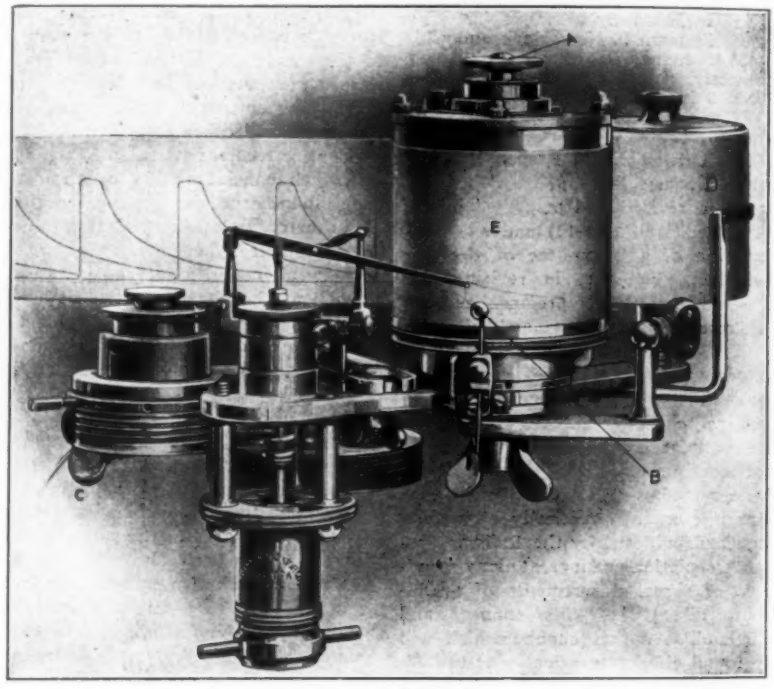
The cord is now pulled out to its full length and held there by means of the detent *C*. The cord hook is then attached to some part of the cross-head from which the driving motion is obtained. By releasing the detent *C*, the indicator is started. If a continuous card is desired, the nut *A* is screwed down, which sets the paper-translating device into action, and a series of cards will be traced upon the paper as shown in the illustration. This strip of paper can be torn off at any place and the cards examined and integrated. A spring and catch is provided for holding the tracing pencil against the drum when taking continuous cards, assuring a uniform pressure on the pencil

If a continuous card is not desired, the nut *A* can be loosened while one card is being traced and then tightened while the engine makes two revolutions, which brings an entire new sheet of paper onto the tracing cylinder and another complete card can be traced by loosening nut *A*. Separate diagrams can thus be taken whenever desired and all the troubles incident to placing new cards on the indicator eliminated.

In the Trill continuous-card indicator the spring is entirely outside of the cylinder, removed from the high-temperature steam, or the cutting action due to wire drawing.

The position of the atmospheric line on the drum can be adjusted by turning the small nut on the pencil motion on the top of the cylinder. This is a distinct improvement over many types of indicators where it is necessary to remove the piston from the cylinder and screw it further up on the rod.

Each indicator is provided with two cylinders, one having an effective area of one-half square inch for low-pressure work and the other having an effective area of one-fourth inch for high-pressure work, such as is met with in gas engines.



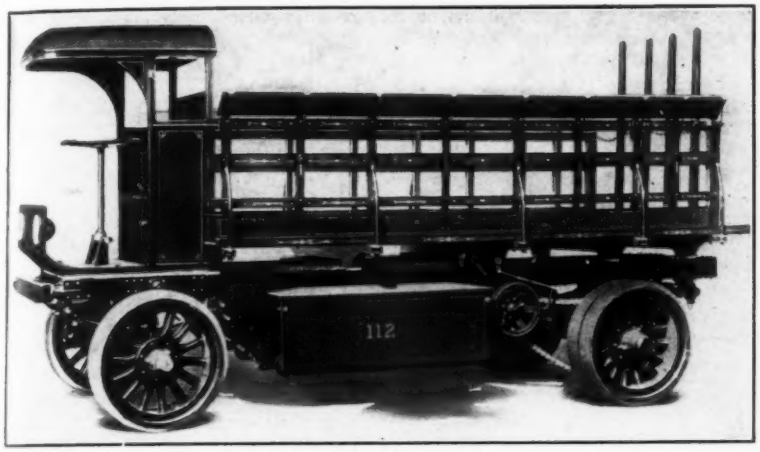
Trill Continuous-Card Indicator.

The Trill indicator is especially adaptable for use on gas engines where the conditions from stroke to stroke vary considerably more than they do in steam-engine practice. By taking continuous cards on gas engines it is possible to see how the mixing valves work and whether the proper mixture of gas and air is furnished for each stroke. It is also possible to learn whether back-firing or pre-ignition occur and whether the timing devices give absolutely accurate ignition for all conditions of loads and speed.

This indicator is manufactured by the Trill Indicator Company, of Corry, Pa.

The Waverley Electric Five-Ton Truck.

A new addition to the Waverley line of commercial vehicles is the five-ton truck shown in the accompanying illustration. Two of these large trucks have recently been delivered to brewing companies in New York and Chicago.



Waverley Five-Ton Truck.

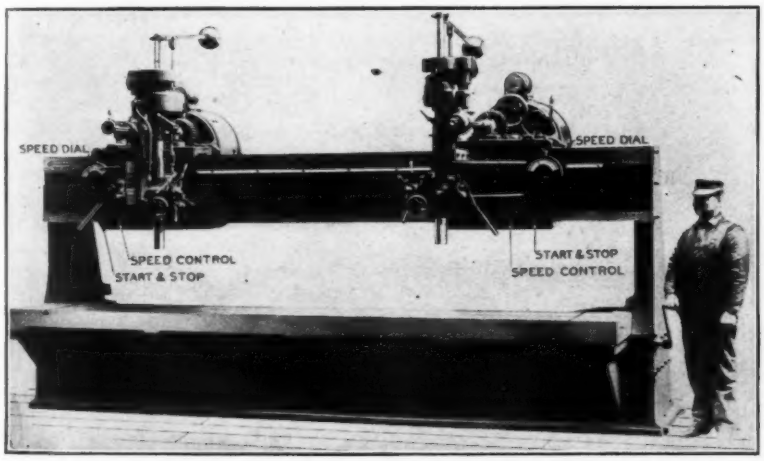
The truck is 17 feet 8 inches long and has a carrying space of 14 feet long by 6 feet 6 inches wide. The car weighs 11,200 pounds, the battery alone accounting for 2,540 pounds of weight.

The battery consists of 42 lead cells each containing 25 plates and has a capacity of 324 ampere-hours. One 85-volt, 60-ampere motor is located at the extreme rear end, with the motor shaft operating heavy chain drives.

The substantial weight of the truck, ten and a half tons loaded, is supported on solid 36 by 7-inch tires in front, and 36 by 5-inch double tires in rear. Massiveness and strength are the chief features of the design, but the car has a rated mileage of 35 miles per charge on level roads.

Motor Drive for a Heavy-Duty Mud-Ring and Flue-Sheet Drill.

The possibility of using a wide speed range in motors, thus making a more direct drive and eliminating gear changes, is well shown by the equipment illustrated herewith. The motors are 7.5-horsepower Reliance adjustable-speed motors of the armature-shifting type having a speed range of 200 to 1,600 revolutions per minute. The shifting of the armature, which produces the speed changes, is accomplished by the small motor mounted on top of the large motor and connected to the shifting mechanism through sprockets and chain. To adjust the speed the operator simply presses the "fast" or "slow" button of the small speed-control station conveniently located at the front of each head.

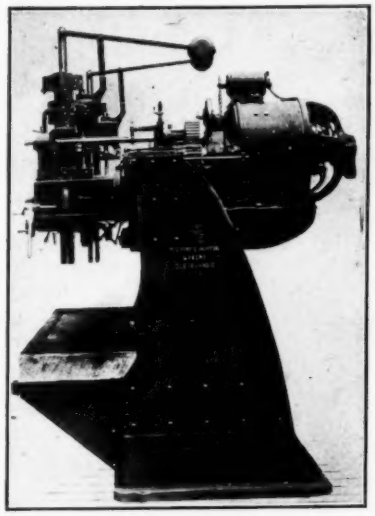


Foote-Burt Heavy Mud-Ring and Flue-Sheet Drill Driven by Adjustable-Speed Motors.

Guess work in setting the speed of the motor to give the best results for each job is eliminated by the Reliance speed dial. This dial is provided with two scales, the upper graduated to show cutting speeds in feet per minute, and the lower the various sizes of drills. The dial is first set for the cutting speed desired by means of the small knurl on the front of the case. The speed of the motor is then adjusted until the pointer is opposite the size of drill to be used.

The starting and stopping of the motor is controlled through automatic starters operated by push-buttons, which are also conveniently located at the front of each head. This combination of automatic starting and speed control relieves the operator of practically all concern regarding the electrical equipment so that he can give his entire attention to his work.

This large drilling machine was made by the Foote-Burt Company, Cleveland, O., and the electrical equipment was made by the Reliance Electric & Engineering Company, also of Cleveland.



End View of Drill Showing One Group of Motors.

A New System of Fire Protection for Railway Yards.

Where electric and other railway cars are stored in an open yard and it is impracticable to protect them by means of automatic sprinklers, a new system has been put on the market by the General Fire Extinguisher Company, which makes use of standpipes and a specially designed nozzle. The nozzle is made so that it can be turned in any direction; it is free from any abrupt turns, so that friction is reduced to a minimum. The use of standpipes at regular intervals throughout the yard, together with the flexibility of the nozzle, insures that every car in the yard can be drenched as soon as the fire is discovered.

The towers are about 20 feet high with a platform at the top for the nozzle. This platform, which has a railing around it, is large enough for a man to work on it easily, while a ladder from the ground furnishes ready access. Once on the platform, a man can see

every car in the yard and can therefore turn the nozzle on the exact point needed. When once he has it fixed in proper position it will continue to pour its water into the heart of the fire, even should the heat drive the man from the platform.

This scheme of fire protection for car yards is an improvement over the old system of a man and the hose, for great difficulty is always experienced in dragging hose between and over cars to get at the blaze. With this standpipe arrangement a heavy stream from the nozzle can be directed without delay against a burning car.

The standpipes are usually supplied with water from the yard main. This supply is supplemented by an electric pump drawing from the city water main, which insures a heavy pressure from the standpipe and elevated nozzle. This pump is controllable from every tower. In addition to these supplies a three-way steamer connection is sometimes made to the standpipe feed main and so arranged that city fire steamers can connect with the hydrant on the city main and pump direct into the car-yard fire service.

In addition to the advantages of elevation, heavy pressure, and minimum expense, this system does away with the old trouble of always keeping watch on the condition of yard hydrants, nozzles, cotton and rubber-lined hose, etc., for there is no hose in this system and the cost of maintenance is therefore a minimum.

Insurance interests have recognized the value of this standpipe nozzle as a fire-fighting agent, and are ready to make considerable reduction in insurance rates to those installing such equipment.

Electrically Driven Street-Washing Machines.

Storage-battery vehicles carrying a heavy tank of water, brushes, and rotating rubber scrapers for road cleaning are in operation in Berlin, Schöneberg, Charlottenberg, Hanover, Strassburg, Dresden, Hamburg, and other cities in Germany. There are 24 at work in Berlin, and six special charging stations where, according to *Electrical Engineering*, current is supplied at 4 cents per kilowatt-hour. Each vehicle is equipped with a 40-cell battery giving 200 ampere-hours on the five-hour rate. This supplies two four-horsepower series motors geared to the front wheels, which are so arranged that the vehicle can practically turn right around with its back wheels on a pivot. The controller provides for speeds of 4, 6 and 9 miles per hour. The total weight of the vehicle without the water is 3.5 tons. The Berlin vehicles cover 18 to 25 miles per day, and cost, including current, about $4.50 per day to run, as compared with $4.68 for a horse vehicle, which covers, however, very much less ground. The use of the electric vehicles is said to effect a saving of over $400 per annum per vehicle.

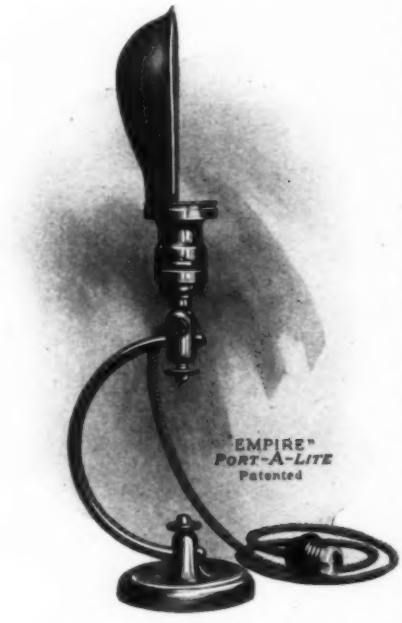
The Portalite.

Portalite is the name given to a recently patented electric lighting fixture that is being manufactured and marketed

Portalite as a Bracket.

by the Empire Brass Manufacturing Company, 8410 Lake Avenue, N. W., Cleveland, Ohio.

The construction of the Portalite is such that any desired adjustment may



Portalite as a Table Lamp.

be obtained in a moment, and the light directed where needed. It is claimed by the manufacturers that the Portalite has a greater range of adjustments than any other portable lighting fixture on the market, while possessing the advantage of being quickly and easily taken apart and packed in a small space for carrying.

In addition to making a practical and convenient desk, piano, reading or study lamp, it can be made into a dressing table, or dining table light, or hung up on the wall or bed, if desired.

The manufacturers pride themselves on the fine workmanship and materials used in the Portalite. The lamps are made in the following finishes: old brass, polished nickel, polished silver and old bronze, with shades and cord to match. Each lamp is neatly packed in a heavy cardboard box ready for use.

The Portalite is being sold through the electric jobbing trade, and orders can now be filled from stock by the principal jobbers in all parts of the country.

Marconi Wireless School in London.

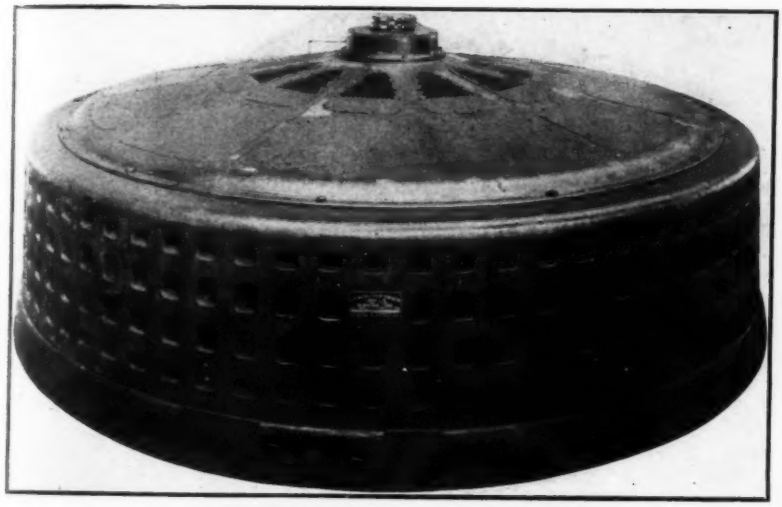
The new headquarters of the Marconi Wireless Telegraph Company in the Marconi House, which was formerly the Gaiety Restaurant, in the Strand, London, are probably the most up-to-date with their extensive equipment of intercommunicating telephones, dictaphones, phonographs, pneumatic tubes, and other facilities for rapid business communication that may be found in Europe. A private wire connects the offices with the powerful wireless station at Clifden, Ireland. An extensive laboratory permits the company's engineers to bring about new wireless developments and to design improvements on existing apparatus.

One of the most interesting features in Marconi House, however, is the new school for wireless operators. This is largely the outcome of the *Titanic* disaster, which has created an extraordinary demand for additional trained operators on every steamship. Within two weeks there were calls for 300 operators. Three sets of marine-type wireless apparatus are employed in the school. Communication is carried on between an aerial on the roof of the building and the Marconi workshops at Chelmsford. Of the great number of applicants that seek positions in the wireless service only those with a fair fundamental knowledge of electrical phenomena and particularly of telegraphy are given an opportunity at wireless training. This training is a rigorous one. Those that are temperamentally unfitted for the work are early weeded out. Others that show any tendency toward unreliability or hesitation are also dropped. Those that are graduated must show complete mastery of the apparatus and ability to assume full responsibility for its operation.

A series direct-current power transmission system 6.5 miles long was recently installed in Great Britain.

Mammoth Generators for Hydroelectric Development at Keokuk.

In the largest power house in the world where will be wrested from the mighty Mississippi River the greatest single instance of conservation of energy ever harnessed for the service of mankind, will be installed ultimately thirty immense vertical waterwheel-type, alternating-current generators that rank in bulk as mammoths among machines for generating electric current. These generators will be placed in the hydroelectric power house at Keokuk, Ia. When completed this building will measure 1,750 feet long, by 123 feet wide by 133 feet high above the foundations, and the plant will develop with the final entire installation over 300,000 horsepower. This gigantic concentration of energy is to supply energy for power, lighting and traffic of towns and cities within a zone of 150 miles or more from Keokuk.



11,000-Volt Generator, 32 Feet in Diameter.

The great dam for impounding the billions of gallons of water to revolve the waterwheels extends from Keokuk on the Iowa shore to Hamilton on the Illinois bank of the river, a distance of 4,568 feet. It is surmounted by a viaduct carrying a 29-foot roadway; rises 50 feet above the average river bed, and contains 119 spillways controlled by steel floodgates, each 30 feet wide by 11 feet high and operated by an electric hoist. This structure is being built in the turbulent stretch of the Mississippi River at the foot of the Des Moines rapids, which are impassable most of the year. Constructed entirely of concrete, the dam will be the longest monolithic structure in the world, having a total overall length of 9,096 feet. In the works are also included a canal lock, 110 feet wide by 400 feet long, with a lift of 40 feet on the Iowa side of the river, and a drydock alongside the lock.

The initial installation of electric generating units will include fifteen alternators direct-connected to the same number of vertical hydraulic reaction turbines of the single-runner type, which will occupy the north half of the power station. Each turbine and generator will form an independent unit. Each wheel, mounted on a vertical shaft 25 inches in diameter, in a spiral chamber 21 feet, 3 inches in diameter and molded in the concrete substructure, will operate at a constant speed of 57.7 revolutions per minute and will have a normal capacity of 10,000 horsepower.

The generators are to be installed on top of the wheel pits directly over the turbines and will be direct-connected to the vertical wheel shafts by forged-steel flanged couplings. The electrical apparatus for this equipment is being furnished by the General Electric Company. Three-phase current will be generated at 11,000 volts. Direct-current excitation for these generators will be supplied by 100-kilowatt motor-generator sets, for which the operating current will be secured from a 2,000-kilowatt, alternating-current waterwheel-driven generator. Eight water-cooled 110,000-volt transformers will be installed for stepping up the voltage of the current to be distributed over the high-tension transmission lines of the company to distant points.

The rotors of the generators operating at slow speed accounts in a measure for the great size of the machines at their rated capacity. The generators measure 32 feet in diameter by 12 feet high, and the total weight of each machine is over 600,000 pounds. Fifteen to twenty freight cars are required to transport one complete generator when dismantled, the shipping weight of which is nearly 700,000 pounds. About 400 cars and 25 locomotives will be needed to haul the shipment of the entire equipment of electrical apparatus for the first half of the installation.

An idea of the magnitude of this hydroelectric power development, when the entire quota of generator units is installed, can be comprehended better by some comparison. The Keokuk plant will develop about three times the power now used for manufacturing in the state of Iowa; more than is now used in the state of Missouri; or one-third of that now used in the state of Illinois, including Chicago and its environs.

The initial equipment will probably be in operation by the middle of 1913. St. Louis is 135 miles distant from Keokuk and will be the first as well as the largest city to avail itself of the power to be transmitted over 110,000-volt lines. Street railway and electric light companies in that city have already contracted for 60,000 horsepower.

Western Electric Business for May.

The Western Electric Company's big increase of 17 per cent in gross for April as compared with April, 1911, represented an "extra normal" month and, as was expected, the May returns did not bear out the heavy April gain. Last month gross sales, says the *Boston News Bureau*, June 20, ran three per cent behind May, 1911, making the total for five months of the fiscal year elapsed one per cent ahead of last year. The April showing was the result of special factors and conditions and was not to be taken as a criterion of trend of the business as a whole. The May returns indicate that the company is running about neck and neck with last year, with the difference slightly in favor of 1912. If the current 12 months show a total equal to the 1911 total of $66,000,000 gross, the management will be well satisfied.

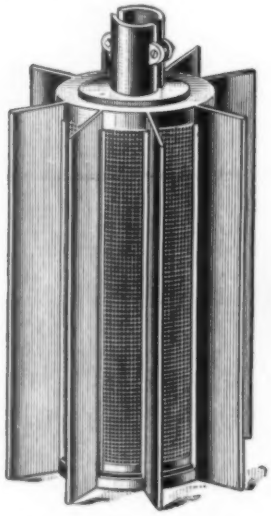
At the Hawthorne works, the great factories where the company formerly manufactured power apparatus have been converted into a central storage warehouse, whence the company ships to its 31 branch houses throughout the country. The advantages of having a large distributing point centrally situated like Chicago are many. The company has no new construction or new financing under consideration. Both of these matters have been provided for several years ahead.

The Southern California Edison Company boasts of having conducted the most persistent and successful campaign for the use of household electric heating devices in this country or the world.

The Maxum Grounding Device.

A new grounding device has been manufactured and placed on the market by the Fairmount Electric & Manufacturing Company, 2203 Pearl Street, Philadelphia, Pa. It is known by the trade name Maxum Grounding Box and has been designed to meet the most exacting requirements of electric light and telephone service. In the construction have been embodied the salient features that have proven most effective in establishing a thorough earth connection which shall be at once efficient and permanent in character.

The Maxum grounding box consists of a hollow cylindrical cast-iron shell about five inches in diameter and 12 inches long. Forming a part of the shell casting are a number of longitudinal ribs that extend outward radially. The center of the box forms a receptacle for holding a special hygroscopic compound of various silicates, sodium salts, carbon and vegetable fiber.



Maxum Grounding Box.

Connection to the ground box is made by means of a one-inch iron pipe that is screwed into the top of the casting and securely fastened to the body thereof by means of a clamping lug. The entire ground box and connecting pipe are heavily galvanized by the hot-dip process, which eliminates possible corrosion due to electrolytic action of the ground current or oxidation of exposed parts. The grounding device has a surface of about 500 square inches, so that the current density per unit area for any discharge is very small.

Tests made upon the Maxum device have shown a very high ampere-hour capacity even under heavy discharge rates without apparent increase in resistance due to local heating. These tests have also proven that the method of supplying a good electrolytic medium to the earth immediately surrounding the ground box is very effective. It has been known that practically all the resistance to current flow from any grounding device lies within a few inches thereof. In the Maxum device the special compound used insures a thorough saturation of the immediate vicinity with electrolytic salts, even if moisture should not be present. However, the compound is of such a character that it very readily draws moisture from a considerable distance to it, thus insuring a permanently moist setting under practically all conditions.

Watson Ventilating Fans.

Specializing in the manufacture of small motors and direct drives, the Mechanical Appliance Company, of Milwaukee, Wis., has naturally developed a line of motor-driven ventilating fans. The blades of the fan were designed after extensive experimenting and are of a somewhat peculiar shape, as shown in the illustration. But it is claimed that practically all air friction is eliminated. Standard sizes include fans of from 18 to 42-inch, driven by one-sixth to one-horsepower motors and having capacities of from 3,400 to 20,000 cubic feet per minute. They are made for direct-current, single-phase and polyphase circuits.

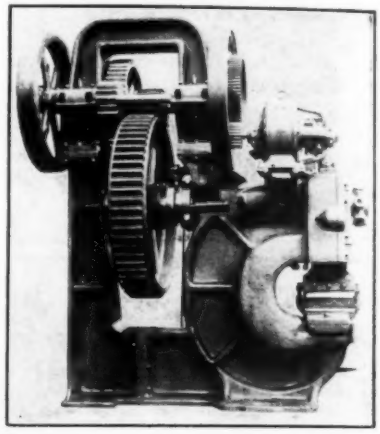
Watson Ventilating Fan.

Punch and Shear Press.

Economy of floor space, always an important item, is particularly so in a machine shop when it is desired to install any additional tools. The accompanying illustration will indicate how this may be effected in the case of a motor-driven punch and shear press, made by the Cleveland Punch & Shear Works, Cleveland, Ohio. The arrangement of overhead gearing renders it possible to make a very compact machine.

The machine complete with its motor weighs approximately 50,000 pounds. It is designed for very heavy work, having sufficient capacity to shear 12 inches of 1.5-inch flat bars, and to punch a five-inch hole in 1.5-inch plate. The various attachments such as those for angle shearing, bar shearing, and punching are interchangeable.

The motor is of 25 horsepower at 230 volts, and is of the direct-current, commutating-pole type, specially adapted for this kind of work by the Westinghouse Electric & Manufacturing Company.



Cleveland Punch and Shear Press.

Some Tall Timber for Duluth.

The Duluth Log Company, Palladio Building, Duluth, Minn., is viewing with much pride a flag-pole which was furnished by it and erected at Duluth. The pole stands 66 feet above the ground line, and was dedicated by the Honorable William Jennings Bryan. The illustration herewith gives a good idea of how this big staff overtops everything else in the neighborhood.

Tall Flag-Pole in Duluth.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

DYSART, IOWA.—The electric light proposition is being agitated by this city.

RIO GRANDE, TEX.—J. Thaison contemplates the establishment of a lighting plant.

SEBASTOPOL, CAL.—The Great Western Power Company has been granted a franchise in this city.

BURKESVILLE, KY.—C. R. Payne has under consideration the installation of an electric light plant.

ROLLA, N. D.—Robert Long, of Hansboro, is interested in a project to build an electric light plant here. C.

BLACK RIVER FALLS, WIS.—Levis & McDonal have the contract to erect the power house and coffer dams. C.

BETHANY, MO.—This city has voted a $25,000 bond issue for the establishment of an electric light plant.

SUISUN, CAL.—Bids will be received until August 6 for the sale of an electric power franchise in this city.

REIDSVILLE, N. C.—American Tobacco Company, New York City, will build a power plant at this place.

DETROIT, MICH.—The Independent Power Company has filed articles of incorporation with a capital stock of $200,000.

OSBORNE, KANS.—The Council of this place is making plans for an extensive improvement in the present lighting system.

GUYTON, GA.—Effington Light & Power Company will install a complete lighting outfit, at an estimated cost of $5,000.

GERING, NEB.—The Alamo Engine and Supply Company, Omaha, will prepare plans for a new water and electric plant for this city. C.

CHICAGO, ILL.—The Aetna Power Company of this place has been granted a permit to do business in Texas, with headquarters in Dallas.

AUSTIN, TEX.—The City Commission has under consideration the installation of an ornamental lighting system on North Congress Avenue. D.

SANTA PAULA, CAL.—The Sulphur Mountain Springs Company plans to install an electric light plant to furnish lights for cottages and tents.

TAYLORSVILLE, KY.—This city is considering the installation of an electric light plant. The mayor should be addressed for details of the project. G.

COOLIDGE, GA.—This town will construct an electric light plant at an approximated cost of $9,000. The Town Clerk has the matter in charge.

SHELBYVILLE, IND.—This city plans to wire the county fair grounds and buildings for electric lighting in time for the fair in August. S.

SHERIDAN, IND.—The City Council is planning to install poles and wires in the town and a pole and wire line to Noblesville, a distance of 11 miles. S.

FORTVILLE, IND.—At a special election it was voted to install a water and lighting system. It is stated the contract will be let for the construction and machinery as early as possible. S.

PHOENIX, CAL.—This city, which has been generating its own power, now intends to put in transformers and purchase its electricity from the government.

FREEPORT, N. Y.—The Village Board has announced its unanimous approval of an appropriation of $18,000 for additions to the equipment of the power plant.

TUCSON, ARIZ.—The Tucson Gas, Electric Light & Power Company has received authorization for the expenditure of $90,000 to be spent on extensions and improvements.

HALLS, TENN.—James S. George, of Memphis, Tenn., has purchased the Halls Light, Water & Ice Company and will install additional generating equipment in the electric light plant. G.

LEITCHFIELD, KY.—Leitchfield Electric Light, Heat & Power Company has been incorporated with a capital stock of $10,000 by Walter D. Hodson, W. T. McCaskey and S. F. Seager.

EAST GRAND FORKS, MINN.—An electric light plant will be built here by the Red River Power Company, of Grand Forks, N. D., and the local lighting system will be reconstructed. C.

HARTWELL, GA.—Clarence Linder, vice-president of the People's Bank, is considering a proposition to develop water power to furnish electricity for light and power.

ATHENS, TENN.—This city has voted to issue bonds in the amount of $38,000, and will shortly begin the construction of an electric light plant. Water works will also be operated. G.

BEATRICE, NEB.—The Beatrice Electric Company will spend $25,000 in improving its plant. Among the improvements will be a brick power house, new machinery and transformers. C.

BRUNSWICK, ME.—The Light & Water Company of Brunswick has been incorporated with a capital stock of $10,000 by L. H. Herring, J. C. Bartlow, John Meyers, Jr., and others.

MARION, KY.—The Marion Electric & Ice Company, of which S. M. Jenkins is president, is now ready to purchase equipment for the purpose of enlarging the capacity of its lighting plant. G.

LOUISVILLE, KY.—Campbell Electric Company has been incorporated with a capital stock of $50,000 by Herbert L. Harries, T. B. Wilson, Fred A. Nobbe and Usaac Kilkewitch.

PITTSBURGH, PA.—The Pennsylvania Light, Heat & Power Company has been granted a 20-year franchise to operate in the first 20 wards of the city, as it does on the North Side.

GROESBECK, TEX.—The Groesbeck Light Company has been sold to some Ennis capitaliists, who, it is reported, will install additional equipment.

ROCKPORT, TEX.—D. E. Savage and associates have purchased the local electric light and power plant and ice factory. They will install about $40,000 worth of machinery in the electric plant, it is reported. D.

MEXICO, MO.—A committee composed of Doctors Rothwell and Taylor and Messrs. Hanly and Pilcher has been appointed to investigate the matter of a "White Way" for the city's down-town streets.

EVERETT, WASH.—Jack S. Burton has been appointed construction engineer for the electric light and power system for Sultan City to be put in by I. C. Anderson, Frank Friese and Herman Friese.

OKLAHOMA CITY, OKLA.—About July 1, Commissioner Guy Blackwelder will begin the installation of a new street lighting system for the city under which there will be 376 arcs, 244 150-watt tungsten lamps, and 362 100-watt tungsten lamps. P.

CLEVELAND, O.—It is reported that Engineer Ballard will soon advertise for bids for the material necessary to start the work on the construction of the new municipal light plant, which it is estimated will cost about $900,000.

LOWELLVILLE, O.—The Republic Railway & Light Company is preparing to erect a $1,500,000 central station at this place for the purpose of furnishing electric power to the large iron and steel companies in the Mahoning and Shenango districts.

ASTORIA, ORE.—Articles of incorporation have been filed for the Elk Creek Light & Power Company by Orrin Kellogg, Otto J. Kraemer and Lester W. Humphreys, with a capital stock of $5,000. The principal place of business is Elk Creek.

WEST SALEM, O.—The West Salem Light & Power Company has been incorporated with a capital stock of $10,000 for the purpose of manufacturing electric light, heat and power. The incorporators are John W. Jackson, John I. Good and John M. Good.

PADUCAH, KY.—A franchise ordinance has been introduced in the City Council at Paducah, Ky., providing for the creation of a privilege for selling electric light, heat and power. It has not been announced who the prospective purchaser of the franchise is. G.

GRAHAM, VA.—A. W. Stover, Dayton, O., and J. M. Hane and C. S. Israil, Columbus, O., with offices in this city, who are representatives of J. G. Russell Company, Dayton, O., have in charge the matter of establishing an electric light and power plant.

LITTLE ROCK, ARK.—The Lake Village Light & Power Company has filed

articles of incorporation with the Secretary of State with a capitalization of $7,000. The incorporators are R. B. Cloggett, M. B. Carson, E. J. Lenz, Henry Crittenden, J. B. Simms and D. T. Gaines.

NEW YORK, N. Y.—Columbia Light, Heat & Power Company has been incorporated with a capital stock of $25,000 to manufacture electricity for light, heat and power. The incorporators are George Leary, Adelbert W. Bailey, New York City; Frederick H. Schomberg, Brooklyn.

KINGSTON, TENN.—The Tennessee Hydro-Electric Company, which was incorporated recently with $100,000 capital stock, plans to build a hydroelectric plant on the Clinch River, just above its juncture with the Emory River, near this place. The company is now engaged in securing Government permission to proceed with its improvements on the Clinch and Powell Rivers. G.

WELLSBURG, W. VA.—The Brooke Electric Company has been incorporated with a capital stock of $10,000 for the purpose of owning and operating electric power plants. The incorporators are Alonzo M. Snyder, Irvine K. Schnaitter, J. Budd, N. I. Young and A. A. McCaslin, of Cleveland, O.

SAVANNAH, GA.—The Eastern Lumber Company plans to spend $1,000,000 on the construction of a lumber and electric plant on the Savannah River. The company will also build a short railroad to Tidewater. George W. Wentworth, of Chicago, is president of the company.

MUSKOGEE, OKLA.—The Muskogee Water Power Company has under consideration building a gigantic hydroelectric power plant on the Grand River, near this place, to be enforced by two subsidiary plants, which will give Muskogee a capacity of 15,000 commercial horsepower, at an expenditure which is estimated at $1,000,000.

DOVER, DEL.—The American Public Utilities Company of Chicago has been chartered here with a capital stock of $40,000,000 by Paul A. Neuffer, Harry H. Phillips, Charles J. Horn, Burrell J. Cramer, of Chicago, Ill., and William J. Maloney, of Wilmington, Del. Among other things the company will construct, maintain and operate electric railways, and furnish light, heat and power by means of electricity.

EVANSVILLE, IND.—The Public Utilities Company, with a capital stock of $6,000,000 has been incorporated. The object of the company is to merge the gas, steam, heat and electric plants, street and interurban railroads, and to operate the same, to create and distribute electricity for light, heat and power. The principal owners are Charles Murdock, of Lafayette, and Charles Finley Smith, of Evansville.

ELECTRIC RAILWAYS.

(Special Correspondence.)

TEXAS CITY, TEX.—The Texas City Terminal Company is interested in plans for the construction of an electric street railway system here. D.

WATERLOO, IOWA.—The Waterloo, Cedar Falls & Northern Electric Company proposes to build and equip an interurban line to Cedar Rapids. C.

EL PASO, TEX.—The offer of the local committee has been accepted, providing for right of way and bonus of $15,000 for the El Paso-Ysleta interurban line.

FOND DU LAC. WIS.—Extensive improvements are planned to the plant of the Eastern Wisconsin Electric Railway Company, which will require an outlay of $50,000.

CRESTON, IOWA.—The Creston, Winterset & Des Moines Road will issue bonds for the completion of the road to Macksburg. About $140,000 will be necessary. C.

LA GRANGE, IND.—It has been authoritatively announced that the St. Joseph Valley Traction Line will in the near future be electrified between La Grange and Bristol.

SIOUX FALLS, S. D.—W. K. Knight, of Chicago, and Mr. Boyle, of Fairmont, are interested in the proposed electric line to run from Sioux Falls, S. D., through Worthington, Jackson, Fairmont, Blue Earth, to Albert Lea.

APPLETON, MINN.—The Wisconsin Traction, Light, Heat & Power Company will build additions to its gas and electric plants, install new equipment and improve the road to Kaukauna. The estimated cost of this work is $50,000. C.

DAYTON, O.—The Wholesaler's and Retailer's Committee of the Chamber of Commerce is interested in the proposed extension of the Dayton, Covington & Piqua Traction line from Covington to Loramie.

CEDAR RAPIDS, IOWA.—The Cedar Rapids & Iowa City Railway Company is making surveys for a line to Vinton. This company is planning to take over all the electric lighting and power plants between Cedar Rapids and Boone. C.

TOPEKA, KANS.—The Independence, Neodesha & Topeka Traction Company has been incorporated with a capital stock of $50,000 for the purpose of building an electric line from Independence to Topeka. The incorporators are T. Blakesly, William Nees, W. A. Spencer and others.

LOUISVILLE, KY.—The Louisville & Interurban Railroad Company has made arrangements with Shelbyville, Ky., for operation in that city, and will extend its line from its present terminus, just outside Shelbyville, through the city and beyond. T. J. Minary is president of the traction company.

TOLEDO, O.—The Toledo & Eastern Traction Company has been incorporated with a capital stock of $40,000 for the purpose of constructing a line from Bono, in Lucas County, to Curtice, in Ottawa County. R. S. Holbrook, N. H. Whitney and Arthur J. Barton are named among the incorporators.

NASHVILLE, TENN.—The Nashville-Gallatin Interurban Railway Company, which is completing the construction of a line between those cities, is considering an extension to Bowling Green, by way of Franklin. Edward Albright, of Gallatin, Tenn., is interested in the project, which will require some $200,000 additional capital.

MICHIGAN CITY, IND.—The Michigan City, Lake Side & St. Joseph Electric Company has filed articles of incorporation with the Michigan Railroad Commission. The capital stock is $750,000. The object of the company is to build an electric railroad from Michigan City, Ind., to St. Joseph, Mich., a distance of 40 miles.

DIXONVILLE, PA.—The Automatic Transportation Company is preparing to build an electric railroad four miles in length from Idamar to Lowry Colliery. The road will be elevated on iron posts set in concrete bases and will, when completed, obstruct the land through which it passes as little as a row of telegraph poles.

NEW YORK, N. Y.—A franchise has been granted to the Manhattan Bridge Three-Cent Fare Line Company to operate from the junction of Flatbush and Atlantic Avenues to the foot of Canal Street, North River, if arrangements can be made for that terminus in Manhattan. The officials of the company announce that cars will be running by the end of the summer.

SAN FRANCISCO, CAL.—The Sacramento & Woodland Railroad has been granted permission to construct its track at grade across the Southern Pacific rails at Mikon. It is directed in the permit to install at its own expense a first-class standard, electric interlocking device with signals and equipment for the greatest degree of safety. The expense of maintaining the device, after installation, is to be shared by the Southern Pacific Company.

PORTLAND, IND.—Articles of incorporation have been prepared by the Huntington, Richmond & Hamilton Railroad for the purpose of constructing an electric road from Portland to Richmond and ultimately to Hamilton, O. The promoters are Chicago people whose object is to acquire the C. B. & Q. railroad and electrify it, thus making an excellent trolly line from Huntington to Hamilton, by way of Bluffton, Portland and Richmond. S.

FORT WAYNE, IND.—The Chicago, Gary & Ft. Wayne Railroad Company has filed articles of incorporation with the Secretary of State. The capital stock is placed at $50,000. The purpose is to build and operate an electric line connecting Fort Wayne and South Bend, and intermediate towns and cities. The road will be about 165 miles long and serve a large population and a rich country. Alexander C. Miller, of Chicago, is president, and Fred H. Wood, L. E. Woodard, A. A. Miller and C. W. Case are the directors. S.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

INDIANOLA, IOWA.—The Hawkeye Telephone Company will sepnd about $6,000 on the local system. C.

MONTREAL, CAN.—The Bell Telephone Company is preparing to lay conduits in 25 streets of this city.

DASSEL, MINN.—The Dassel and Collingwood Telephone Company will replace its overhead wires by a cable. C.

ORANGE, CAL.—The Pacific Telephone & Telegraph Company has been granted a 45-year franchise in this city.

RIVES, TENN.—Home Telephone Company has been organized by E. L. Bowers, T. P. Clement, W. A. McNail and others.

BEAVER DAM, WIS.—The Wisconsin Telephone Company will enlarge its local exchange by the addition of new circuits. L. E. Martin is manager. C.

NEW YORK, N. Y.—Commerce Telegraph Company has been incorporated with a capital stock of $5,000 by Dennis W. O'Day and James J. Purcell, all of New York City.

SAN LUIS OBISPO, CAL.—The San Miguel Telephone Company has been incorporated with a capital stock of $5,000 by T. H. Rouquet, W. H. Sutton, W. A. Wilmer, H. H. Durham and L. Van Horn.

IOWA CITY, IOWA.—The Wagner Telephone Company has changed from a corporation to a joint stock company. Robert Jones is president and William Berkey, secretary. The local system will be improved. C.

BIRMINGHAM, ALA.—The Mutual Telephone Company of Chalkville has been incorporated with a capital stock of $1,000. W. R. Rich is president and T. W. Franklin, secretary and treasurer of the new company.

CLAY CITY, IND.—The Clay City Mutual Telephone Company has been incorporated with a capital stock of $10,000. The directors are S. E. Roey, Arthur Mageline, C. W. Hurst, John Middlemas and B. V. Goshorn.

HYDRO, OKLA.—An Oklahoma charter has been granted to the South Canadian Mutual Telephone Company, the capital stock being $500. The incorporators are S. W. Hosey, E. S. Lipscomb and J. B. Norris, all of Hydro.

MEXICO CITY, MEX.—The Mexican Telephone & Telegraph Company, an American-owned concern with headquarters in this city, has been granted a concession by the City of Guadalajara to put in an entirely new telephone system, at a cost of about $250,000 gold. The wires are to be placed underground throughout the city.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

NO. 9000. ELECTRC RAILWAY.—Prominent business men in a country of the Far East are interested in plans for an electric railway to be 35 miles long, but extensions may easily be made to connect other important cities in the country in question. American manufacturers should make a special effort to supply the first materials purchased for this line, as this will likely determine the character of those which will be used in the branch lines to be constructed later. An American consul writes that the promoters of the line would like to receive figures showing in detail the cost of the necessary machinery and equipment for this undertaking.

NO. 9028. TELEPHONE EQUIPMENT.—A telephone company in a foreign country has under construction a public telephone line which will be completed in the near future. Another telephone company in the same country has decided to install a modern telephone exchange for general and exchange business, while a number of extensions will be made by both companies.

PROPOSALS.

ELECTRIC TRAVELING CRANES.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 6 for four electric traveling cranes for the Naval Station at Pearl Harbor, Hawaii. Plans and specifications may be obtained by application to the above bureau or to the commandant of the naval station named.

ELECTRIC CONDUITS AND WIRING, AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., for electric conduits and wiring, and interior lighting fixtures until July 26, for the post office and custom house at Oil City, Pa.; until July 29, for the post office and custom house at Bristol, R. I.; until August 3, of a two-story building for the postoffice at Carrolton, Ga. Drawings and specifications may be obtained from the custodian of the various sites or from the office of the Supervising Architect.

NEW INCORPORATIONS.

LOUISVILE, KY.—Campbell Electric Company has been incorporated with a capital stock of $50,000 by Herbert L. Harries, T. B. Wilson, Fred A. Nobbe and Isaac Mikewitch.

NEW YORK, N. Y.—Utility Supply Company has been incorporated with a capital stock of $6,000 by Henry R. Johnston, John D. Feeny and Frank W. Moxley, all of New York City. The company will deal in electrical goods.

NEW YORK, N. Y.—Electric Sterilizing Company has been incorporated with a capital stock of $2,000 by Henry R. Johnston, John L. Feeny and Frank W. Moxley, all of New York City.

NEW YORK, N. Y.—Duplex Electric Company has been incorporated with a capital stock of $5,000 by Malcolm Sundheimer, Otto M. Sternfeld, New York City, and A. Maurice Levine, Brooklyn.

SAN ANTONIO, TEX.—Volt-Ampere Company has been incorporated with a capital stock of $10,000 to deal in electrical batteries and other electrical supplies. The incorporators are Yale Hicks, W. S. E. Rolaff and J. O. Luthy.

MAUMEE, O.—The Independent Electric & Construction Company has been incorporated with a capital stock of $10,000 to deal in light, heat and power. The incorporators are N. F. Evans, Leger J. Metzger, Carl J. Lindecker, Eugene Rheinfrank and F. W. Crabbs.

ST. LOUIS, MO.—Thobal Electric Company has been incorporated with a capital stock of $50,000. The incorporators are Daniel Tibbals, Emile Thomas and Lewis Knapp. The company will buy, sell and deal in electrical and mechanical machinery and devices, etc.

NEW PUBLICATIONS.

ACCIDENTS IN COAL MINES.—The Bureau of Mines has published a preliminary statement of coal-mine accidents in the United States which covers the years 1910, 1911 and the first third of 1912. It is shown that the fatalities from electric shock or burns form a very small percentage of the total, constituting 3.5 per cent in 1911 and 2.0 per cent for the first three months in 1912.

A NEW ANALYSIS OF THE CYLINDER PERFORMANCE OF RECIPROCATING ENGINES.—A pamphlet just issued by the Engineering Experiment Station of the University of Illinois apparently contains much matter that is new on the subject of cylinder performance in reciprocating steam-engines. Condensation on cylinder walls, value of the exponent of the expansion curve of steam under various conditions, leakage of engines, methods of determining steam consumption, and a number of other kindred matters are dealt with. Experiments carried on to secure data found in the pamphlet are incorporated.

THE POLYTECHNIC ENGINEER.—Volume XIII of the *Polytechnic Engineer*, which is published annually by the undergraduates of the Polytechnic Institute of Brooklyn, N. Y., has come to hand. Among other technical papers it contains "Effective Current Values of Decadent Electric Oscillations," by Erich Hausmann; "Solution of Exponential Equations by Means of the Hyperbolic Functions," by Hazen G. Tyler; "A Wireless Telegraph Station," by Irving Weed.

ATMOSPHERIC NITROGEN.—The importance of nitrogenous compounds to the agricultural and industrial interests of Europe and Asia has prompted the Bureau of Manufactures to issue a monograph on the subject of utilizing atmospheric nitrogen in the production of such compounds. Remarkable results have been obtained in Norway by means of electric furnaces in which atmospheric nitrogen is oxidized to the form of nitric oxide, which is used in making calcium nitrate, or Norway saltpeter. This Norwegian product is already an important rival of Chile saltpeter, but as the success of the process depends upon a very cheap supply of electricity, it will probably not be used to any great extent in the United States until the furnaces have been made more efficient.

THE EFFECTS OF COLD WEATHER UPON TRAIN RESISTANCE AND TONNAGE RATING.—Bulletin No. 59 issued by the Engineering Experiment Station of the University of Illinois, Urbana, Ill., deals with this subject in considerable detail. It is pointed out that the resistance offered by railway trains is greater in cold weather than in summer. This has led to the practice of reducing tonnage ratings of locomotives in winter. There are three variables which modify train resistance. These are speed, weight of cars, and air temperature. Two years ago the Railway Engineering Department of the University began experiments to determine the increase in train resistance due to cold weather. While the work is not yet complete, it has gone far enough to develop interesting results, which are enumerated in the pamphlet. The bulletin discusses the effects of cold weather upon the tractive effort of a locomotive, upon total train resistance, etc. A number of valuable curves and tables are included.

SAFETY IN MINE INSTALLATIONS.—The United States Bureau of Mines has just issued technical paper No. 19, written by H. H. Clark, on the subject, "The Factor of Safety in Mine Electrical Installation." The author points out the many advantages that are known to attend the use of electrical machinery in mines, and urges that the requirements of safety as well as those of efficiency be considered when installing electrical mining equipment. The paper calls attention to the fact that wherever the service conditions are indeterminate or variable, engineers are accustomed to use factors of safety in their designs, especially in those cases where the protection of human life is a consideration. The author believes that a similar factor of safety should be used in connection with the electrical equipment of mines. The paper proceeds to classify the electrical accidents that may occur in mines and states the principal sources of danger incident to the use of electricity underground. The paper lays stress upon the importance of first-class installation at the outset and frequent inspection of equipment after it is in place. Copies may be obtained from the Director of the Bureau of Mines, Washington, D. C.

FINANCIAL NOTES.

Despite the unsettling tendencies of the political situation, there has been little real liquidation of securities and it appears as if the market view will be of a constructive nature no matter how things fall out. The view is based upon current indications in commerce, industry and agriculture. Crop prospects are excellent and good yields in the fall should go a long way toward reducing the high cost of living.

The steel trade is booming with order tonnage at the high record since the panic of 1907, and with prices on the high road to recovery from the unprofitable basis of the past year or so. The copper trade is now in an extremely strong position, with greatly reduced stocks on demand in face of heavy demand, resulting in a remarkable enhancement of price. This has been followed by the declaration of higher dividends by many of the leading copper producing companies of the country.

Our foreign trade goes on expanding by leaps and bounds, with each succeeding month establishing new high records, both as to exports and imports. The total volume of trade between this and other countries during the fiscal year just expiring will also establish a new high record. For the eleven months already elapsed exports have run $158,990,475 ahead of those for the corresponding period of the previous year and imports are $117,718,054 greater, so that this year's balance of exports is $41,272,421 greater than the export balance of last year, which was a high record. The significant feature of this wonderful record of foreign trade is the increasing volume of manufactured exports.

Upon petition of the Continental & Commercial Trust Savings Bank as trustee for Allis-Chalmers Co., the Federal Court appointed P. W. Call, president of the Allis-Chalmers Company, and Otto H. Fall, ancillary receivers in Northern District of Illinois, Middle District of Pennsylvania, and Northern District of California.

The Montgomery Light & Traction Company has sold $650,000 six-per-cent, two-year secured gold notes to the Guaranty Trust Company, of New York City.

Cities Service common and preferred stocks have been listed on the London Stock Exchange.

The $5,000,000 five-year, six-per-cent collateral trust notes of the Northern States Power Company, of which $2,500,000 were purchased by the Guaranty Trust Company, of New York City, and $2,500,000 by H. F. Backman & Company, of Philadelphia, are being offered at par and interest.

The Central Trust Company, Kuhn, Loeb & Company, and Kidder, Peabody & Company, of New York City, announce that no further application will be received to the $40,000,000 Brooklyn Rapid Transit Notes Syndicate, the amount having been largely oversubscribed. Applicants will be given only a moderate portion of the amounts applied for.

Dividends.

American Power & Light Company; a quarterly preferred dividend of 1.5 per cent, payable July 1 to stock of record June 24.

American Telephone & Telegraph Company; the regular quarterly dividend of two per cent, payable July 15 to stock of record June 29.

Athens Railway Company; a semi-annual dividend of 2.5 per cent, payable July 1 to stock of record June 30.

Auburn & Syracuse Electric Railroad; a quarterly dividend of 1.5 per cent, payable July 15 to stock of record June 29.

Baltimore County Water & Electric Company; a semi-annual dividend of 2.5 per cent, payable July 1 to stock of record June 20.

Bell Telephone Company of Canada; regular quarterly dividend of two per cent payable July 15 to stock of record June 24.

Birmingham Railway, Light & Power Company, semi-annual dividend of four per cent on the common stock, and three per cent on the preferred stock, both payable June 29 to stock of record June 22.

Chicago City & Connecting Railways; a semi-annual dividend of one per cent, payable July 1 to stock of record June 20.

Cincinnati, Hamilton & Dayton Traction Company; a quarterly preferred dividend of 1.25 per cent, payable July 2 to stock of record June 20.

Columbia Railway, Gas & Electric Company; a quarterly preferred dividend of 1.5 per cent, payable July 1 to stock of record June 25.

Consolidated Gas, Electric Light & Power Company, of Baltimore; a quarterly dividend of 1.25 per cent, payable July 1 to stock of record June 20.

Duluth Edison Company; a quarterly preferred dividend of 1.5 per cent, payable July 1 to stock of record June 20.

Electric Storage Battery Company; quarterly dividends of one per cent each on the common and preferred stocks, payable July 1 to stock of record June 27.

Interborough Rapid Transit Company; an extra dividend of five per cent.

Little Rock Railway & Electric Company; a common dividend of five per cent, and a semi-annual preferred dividend of three per cent, both payable June 29 to stock of record June 22.

Michigan State Telephone Company; a quarterly dividend of 1.5 per cent on the common stock and the regular dividend of 1.5 per cent on the preferred, both payable June 29 to stock of record June 15.

National Carbon Company; the regular quarterly dividend of 1.5 per cent on the common stock, payable July 15, to stock of record July 5.

Otis Elevator Company; quarterly common and preferred dividends of one per cent and 1.5 per cent, respectively, both payable July 15 to stock of record June 29.

Ottawa Electric Railway Company; a quarterly dividend of 2.5 per cent, payable July 1 to stock of record June 29.

Pacific Gas & Electric Company; a quarterly dividend of $1.25 per share on the common stock, payable July 15 to stock of record June 15.

Philadelphia Company; a quarterly dividend of 1.75 per cent on the common stock, payable August 1 to stock of record July 1, an increase of one-quarter of one per cent quarterly.

Reading Traction Company; a semi-annual dividend of seventy-five cents per share, payable July 1 to stock of record June 20.

Rome Railway & Electric Company; a quarterly dividend of 1.5 per cent, payable July 1 to stock of record June 25.

South Side Elevated Railroad Company; a dividend of 2.875 per cent; payable June 29 to stock of record June 21.

Terre Haute, Indianapolis & Eastern Traction Company; a preferred dividend of $1.25 per share, payable July 1 to stock of record June 20.

Tri-City Railway & Light Company; a quarterly preferred dividend of 1.5 per cent, payable July 1 to stock of record June 21.

United Light & Railways Company; regular quarterly dividends of 1.5 per cent on the first preferred, and 0.75 per cent of the second preferred stock, both payable July 1 to stock of record June 20.

Washington Water Power Company; a quarterly dividend of two per cent, payable July 1 to stock of record June 15.

Westinghouse Electric & Manufacturing Company; the regular quarterly dividend of 1.75 per cent on the preferred stock, payable July 15 to stock of record June 29.

Winnipeg Electric Railway Company; a quarterly dividend of three per cent, payable July 2 to stock of record June 20.

Reports of Earnings.

ONTARIO POWER COMPANY.

The Ontario Power Company, of Niagara Falls, has issued its pamphlet report for the year ended December 31, 1911. The combined income account of the Ontario Power Company of Niagara Falls and the Ontario Transmission Co., Ltd. (inter-company payments eliminated) compares as follows:

	1911	1910
Gross earnings	$868,052	$721,901
Operating expenses	148,394	136,100
Net earnings	719,657	585,801
Other income	14,629	22,161
Total income	734,286	607,962
Charges	610,226	520,449
Surplus	*124,060	87,513

*Equal to 1.59 on $8,215,000 stock of Ontario Power Company of Niagara Falls outstanding.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 24.	June 17.
Allis-Chalmers common (New York)	⅝	⅝
Allis-Chalmers preferred (New York)	1⅞	1⅞
American Tel. & Tel. (New York)	146	145½
Commonwealth Edison (Chicago)	139¼	139
Edison Electric Illuminating (Boston)	286	285
Electric Company of America (Philadelphia)	*12¼	*12¼
Electric Storage Battery common (Philadelphia)	55½	56
Electric Storage Battery preferred (Philadelphia)	55½	56
General Electric (New York)	172	169
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	2	2¼
Massachusetts Electric common (Boston)	19¾	19¾
Massachusetts Electric preferred (Boston)	*92	*92
National Carbon common (Chicago)	115	115
National Carbon preferred (Chicago)	117	116
New England Telephone (Boston)	152½	150
Philadelphia Electric (Philadelphia)	22	22⅛
Postal Telegraph and Cables common (New York)	87½	84
Postal Telegraph and Cables preferred (New York)	69	68½
Western Union (New York)	82	82
Westinghouse common (New York)	72¼	72½
Westinghouse preferred (New York)	*118	118

*Last price quoted.

WEST PENN. TRACTION.

The report of the West Penn. Traction & Water Power Company, a subsidiary corporation of the American Water Works & Guarantee Company, for the year ended March 31 shows net earnings of $1,210,684, against $1,056,700 the previous year. A summary of the income account compares as follows:

	1912	1911
Gross earnings	$2,427,481	$2,059,227
Net earnings	1,210,684	1,056,700
Surplus	$707,933	$613,321

The West Penn. Traction & Water Company took over the West Penn. Traction Company and its subsidiary corporations, as of January 1, 1912. It controls and operates 209 miles of traction lines in the Pittsburgh district, its cars entering that city. It also furnishes light and power to 110 towns and cities in the district.

NEW YORK TRACTIONS.

The earnings of the principal New York traction lines as reported to the New York Public Service Commission for the month of February, 1912, follows:

	Rev. Car Mileage	Total Str. Oper. rev.	St. Rwy. Op. inc.	Other Income
Hudson & Manhattan	$ 637,060	$ 298,387	$ 170,364	$ 78,451
Interboro suburban	5,607,628	1,402,338	826,093	26,831
Interboro elevated	5,409,718	1,233,745	578,520	2,486
Brooklyn Rapid Transit:				
Brooklyn Union Elevated	2,283,897	604,139	230,035	13,111
Brooklyn Heights	2,131,894	625,659	183,262	11,499
One-half Brooklyn Operating Company	25,425	10,019	4,984	.....
Brooklyn, Queens County	441,926	117,631	32,409	4,100
Coney Island & Grand	9,638	1,271	*1,789	1,103
Nassau Electric	1,295,229	338,210	74,925	12,373
Sea Beach	52,195	10,261	237	80
South Brooklyn	108,409	17,672	*3,227	1,551
New York Railways	3,005,658	1,031,166	278,427	32,174
One-half Brooklyn Operating Company	25,425	10,019	4,984	.....
Central Park, N. & E. River	166,314	45,638	*3,699	.....
†Second Avenue	302,187	65,872	*272	.....
Third Avenue	524,545	290,738	121,506	.....
†Dry Dock	142,868	48,136	*4,286	.....
†Forty-second Street	314,563	127,839	18,379	.....
New York City Interborough	159,553	30,835	4,233	.....
South Boulevard	43,174	8,527	1,465	.....
†Union	757,085	171,539	30,143	.....
†Westchester Electric	190,013	39,765	4,329	72
†Yonkers Railroad	217,855	50,126	673	.....
Long Island Electric	67,319	12,896	*3,370	23
New York & Long Island Transit	118,976	24,376	733	45
New York & North Shore	47,574	9,576	903	43
New York & Queen City	463,074	84,951	*27,096	.....
Ocean Electric	28,134	4,061	*1,068	.....
Coney Island & Brooklyn	427,856	98,217	17,717	2,278
Richmond, L. & R. R.	108,930	22,287	*933	19,175
South Island Midland	98,887	15,527	499	.....

*Deficit.
†Operated by receivers.

KEYSTONE TELEPHONE COMPANY.

The Keystone Telephone Company reports as follows for May and five months ended May 31:

	1912	1911
May gross	$101,653	$ 98,839
Net after taxes	51,599	50,536
Surplus after charges	26,795	26,271
Five months' gross	496,080	484,263
Net after taxes	248,351	243,616
Surplus after charges	123,465	121,748

CITIES SERVICE COMPANY.

Cities Service Company earnings for May and for twelve months ended May 31 were:

	May, 1912	May, 1911
Gross earnings	$78,981	$58,657
Net earnings	73,500	56,651
Preferred dividends	50,962	42,618
Common dividends	18,310	12,028
Surplus	4,228	2,005

Total accumulated surplus to May 31 over all dividends was $460,347.

PHILADELPHIA RAPID TRANSIT.

The Philadelphia Rapid Transit Company reports as follows for May and eleven months ended May 31:

	1912	1911
May gross	$2,044,796	$1,972,348
May net	814,278	795,560
Surplus after charges	65,030	57,881
Eleven months' gross	20,710,366	19,628,437
Eleven months' net	7,953,283	7,574,617
Deficit after charges	199,261	470,517

ELECTRIC BOND & SHARE COMPANY.

The Electric Bond & Share Company reports the following earnings of controlled companies for May, and the twelve months ended May 31:

	1912	1911
PORTLAND (ORE.) GAS & COKE CO.		
Gross earnings	$ 88,177	$ 81,741
Net earnings	45,207	39,160
Net income	29,907	29,217
Twelve months:		
Gross earnings	$1,110,298	$ 975,937
Net earnings	552,260	461,803
Net income	375,013	310,687
PACIFIC POWER & LIGHT CO.		
Gross earnings	$ 103,767	$ 99,378
Net earnings	52,920	44,957
Net income	28,691	17,486
Twelve months:		
Gross earnings	$1,198,354	$1,146,173
Net earnings	560,523	551,377
Net income	221,630	316,825
KANSAS GAS & ELECTRIC CO.		
Gross earnings	$ 72,714	$ 74,166
Net earnings	25,043	21,472
Net income	12,059	14,726
Twelve months:		
Gross earnings	$1,011,745	$ 961,879
Net earnings	352,734	324,593
Net income	210,422	227,580

EDISON COMPANY OF BOSTON.

The Edison Electric Illuminating Company of Boston reports as follows for May and eleven months ended May 31.

	1912	1911
May gross	$ 447,761	$ 397,684
May net	238,079	201,821
11 months gross	5,358,509	4,859,291
11 months net	3,178,758	2,801,161

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company reports as follows for May and five months ended May 31:

	1912	1911
May gross	$ 320,720	$ 309,609
May net	310,028	299,702
Five thousand gross	1,664,067	1,696,649
Five thousand net	1,611,656	1,649,593

PERSONAL MENTION.

WILLIAM GRANT CHAMBERLAIN, an electrical engineer with the Western Electric Company, New York City, was married on June 19 to Miss Hazelle Lorain Helfrich, of Bowling Green, O.

REGINALD B. HAMILTON, has been elected vice-president of the Philadelphia Rapid Transit Company, to succeed Alexander Rennick, resigned. Mr. Hamilton was formerly vice-president of the Chicago City Railways Company.

H. G. BURD, who for some time has been connected with the Standard Underground Cable Company, as sales engineer in the New York office, has been appointed assistant to the sales manager of the Standard Underground Cable Company of Canada, Limited. Mr. Burd will in future be located in Hamilton, Ont.

WILLIAM H. MARSH, who for the past ten years has been connected with the Standard Underground Cable Company, of Pittsburgh, Pa., in the capacity of superintendent of construction, has been appointed secretary, assistant treasurer and sales manager of the Standard Underground Cable Company of Canada, Limited. Mr. Marsh will hereafter make his headquarters in Hamilton, Ont.

C. A. BRAY, of the General Electric Company, was one of the leading speakers at the recent convention of the Kentucky Mining Institute, which was held in Lexington. His subject was, "Mine Haulage Systems," and he discussed the various factors in favor of the use of electrical haulage. The talk attracted much attention owing to the large number of mines which are being opened in Eastern Kentucky. Most of these have installed electric power plants.

ALBERT JACKON MARSHALL, who for the past seven years has been associated with the Holophane Company in the position of chief engineer, in charge of its engineering department, and subsequently manager of its architectural department, announces his affiliation with F. Laurent Godinez, consulting lighting specialist to public-utility corporations, to take effect on July 1. Mr. Godinez, who has had a thorough training in all phases of public-utility work for several years, has been acting in an advisory capacity to a clientele composed of large combination gas and electric properties. Hereafter this work will be conducted under the name of "F. Laurent Godinez and Albert Jackson Marshall, Consulting Specialists." The atelier and research laboratory of Mr. Godinez, at 123 Duncan Avenue, Jersey City, will be the firm's headquarters and also serve as an experimental station for allied public-service corporations. The elaborate equipment and appurtenances of the atelier and laboratory are entirely original. Every phase of decoration, applied art, psychology and heretofore disregarded physiological factors have been utilized to place investigations and development of lighting conditions on the highest plane—where they may receive a broad, intelligent consideration. The successful educational work with representatives of public-utility corporations, and elaborate public lectures on "Light," in behalf of relation policies, originated by Mr. Godinez, will be continued. Co-operative work with architects will be conducted by Mr. Marshall, and the plan of extending consultation to decorators and lighting-fixture concerns of the highest class, will be adhered to.

OBITUARY.

THOMAS BLAKE, who for over 30 years was connected with the United Direct Cable Company, died at his home in Brooklyn, N. Y., recently at the age of 59.

DATES AHEAD.

New England Electrical Workers' Association. Providence, R. I., July 13-14.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 16-19.

Ohio Electric Light Association. Annual convention, The Breakers, Cedar Point, O., July 16-19.

International Association of Municipal Electricians. Annual convention, Peoria, Ill., August 26-30.

International Association for Testing Materials. Sixth congress, New York City, September 3-7.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 16-21.

The 1912 Boston Electric Show, Mechanics Building, Boston, Mass., September 28-October 26.

American Electric Railway Association and its five affiliated associations. Annual Convention, Chicago, Ill., October 7-11.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 10-11.

The New York Electrical Exposition and Automobile Show. The New Grand Central Palace, New York City, October 9-12.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

With the Electrical Manufacturers

Hess & Son, Philadelphia, Pa., have prepared a circular relating to Tinol, which is a new and complete solder in paste form. Directions for using this composition are given, and the Tinol torch is also described.

Macgovern & Company, 114 Liberty Street, New York City, has issued a new catalog of electrical and steam machinery, cars and car equipment that it has on hand. All of this equipment is in practically first-class condition, although once used.

Pacific Electric Heating Company, Ontario, Cal., has issued a folder appealing particularly to dealers and calling attention to its great variety of electric heating and cooking devices, and the very aggressive advertising campaign which is being very extensively carried out this year.

Fairmount Electrical Manufacturing Company, Philadelphia, has issued bulletins No. 28-B and No. 29-B, describing and illustrating, respectively, the Fairmount 15,000-volt switchboard insulators and the "Maxum" grounding box. Copies of these bulletins will be sent to those interested upon request.

The Durr Manufacturing Company, Pittsburgh, Pa., manufacturers of Barret lifting jacks, has purchased five acres of ground on Preble Avenue, Northside, Pittsburgh, and will start at once the erection of a new factory, which, it is said, will be the largest in the world devoted exclusively to the manufacture of lifting jacks.

Bay State Insulated Wire and Cable Company, of Hyde Park, Mass., will install in its factory an additional horizontal return-tube boiler 72 inches in diameter and 18 feet 6 inches long. The boiler will have Macdonald shaking grates. This equipment with smoke flue is now being made in the shops of the Robb Engineering Company, South Framingham, Mass.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has published a bulletin entitled "The Power of Advertising," by H. C. Slemin, sales and advertising manager. This is written especially for the benefit of independent telephone men. The bulletin outlines in a general way the specific value of advertising of various kinds and illustrates a great many different advertisements which can be used by the independent telephone company.

Westinghouse Electric & Manufacturing Company reports that among the numerous orders it has received for electric-railway equipment a few notable ones were from the Susquehanna Railway, Light & Power Company, Lancaster, Pa., 18 quadruple equipments of type 101B2 motors and type K28B control, and the Havana Electric Railway Company, Havana, Cuba, for 30 double equipments of No. 323-A motors.

Pettingell-Andrews Company, Boston, Mass., in the June issue of its house organ, "Juice" which is livened up as usual by the bright sayings of the "Bite," calls attention to the growth of its fixture department and the excellent equipment of its new fixture-display rooms. Reference is also made, among other things, to the elaborate plans for the Boston Electric Show to be held this fall.

C. W. Hunt Company, West Brighton, N. Y., has issued a folder illustrating a number of installations of its industrial railway system and calling attention to the valuable features embodied therein. A great variety of rolling stock can be provided to suit the conditions in any particular plant. Among this equipment is the Hunt motor car, which is a trolley car that can be used either as a tractor for hauling or as an independent carrying unit.

General Electric Company, Schenectady, N. Y., has issued a number of interesting bulletins as follow: No. 4951, devoted to street lighting with Edison Mazda series lamps; No. 4952 devoted to a description of the series incandescent street-lighting system furnished by the General Electric Company; No. 4950, describing the Washington, Baltimore & Annapolis 1,200-volt, direct-current railroad; No. 4925, describing the combined unit mercury-arc rectifier outfit; No. 4880, describing the type S-2 signal volt-ammeter.

Hubbard & Company, Pittsburgh, Pa., has issued through its Peirce Specialty Department a series of current instruction sketches. This comprises some 35 views showing good practice in various features of central-station distributing-line work. The booklet is an enlarged reprint of a folder of instructions on the use of Peirce brackets that has been prepared by the Engineering Department of the Toronto Electric Light Company. The booklet also contains some valuable data on copper wire, pole settings, line sag, etc., and will be found of great value by central-station companies having extensive distributing networks.

The Auto-Electric Refrigerating Company, Chicago, Ill., has ready for distribution a booklet devoted to its electro-refrigerating apparatus. These machines are compact and automatic and are designed for use in homes, stores and other places where a small amount of refrigeration is desired. They are designed in six sizes, having a refrigerating capacity of from 200 to 6,000 pounds in 24 hours, and are operated by motors from one-sixth to six horsepower. A thermostat is provided with each machine, which controls the motor and any desired degree of refrigeration may be maintained.

Guarantee Electric Company, Van Buren and Clinton Streets, Chicago, announces that to facilitate the settling of the estate of the late G. B. Shaw, who owned the control of the company, the supply branch of the business which has been featured for the past few years, will be closed out. The motor and dynamo repair work of all kinds, trading in and renting of electrical machinery, will be taken over by the department managers who have handled this work for years past. All stock, consisting of standard light and power supplies, second-hand machines, controlling devices, etc., is now being offered for sale at bargain prices.

Flintkote Manufacturing Company, 88 Pearl Street, Boston, Mass., has manufactured a new composition rubber matting, for which it is finding much demand in every class of building from hospitals to office buildings and power plants. This material is sold under the trade name of Adamat Flooring. It is composed of a felt mat base with a gum surfacing on both sides, thus making both sides serviceable as walking surfaces. The material has no odor, is water and acid proof, is a good insulator, and is perfectly smooth, making it easy to clean, but it has not a slippery surface. The manufacturers claim that it will not harden or oxidize.

Record of Electrical Patents.

Issued by the United States Patent Office, June 18, 1912.

1,029,590. Automatic Switch. E. E. Clement, Washington, D. C. For an automatic telephone system; has the contact banks in vertical parallel rows.

1,029,591. Electrical Switching Apparatus for Telephone Systems. E. E. Clement, Washington, D. C. The contacts are mounted on a long, flat, open frame.

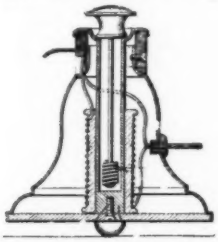
1,029,593. Connecting Circuit for Magneto Telephone-Exchange Systems. E. H. Colpitts, assignor to Western Electric Co., New York, N. Y. Includes induction coils with condenser shunted around the windings of one coil to afford a high impedance to the ringing current.

1,029,598. Liquid-Level Indicator. D. G. Davies, Spokane, Wash. An electric level indicator for reservoirs.

1,029,611. Electrical Outlet Box. W. F. Irish, Denville, N. J. A box for combination outlets is adapted for electric service only by having a special stud for the gas pipe.

1,029,618. Advertising Device. J. J. Lepper, Milwaukee, Wis. A movable demon-like image carries a spear that intermittently closes a lamp circuit.

1,029,627. Traction Elevator. C. O. Pearson, New York, N. Y. The elevator is suspended by means of flat over-



1,029,723.—Electric Cigar Lighter.

lapping cables passing over separate sheaves that are driven by separate electric motors.

1,029,649. Automatic Ringing System. A. H. Weiss, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. The battery and ringing circuits are simultaneously connected to separate bridges of the called line.

1,029,675. Floor Tread. F. Erlach, Iron Mountain, Mich. Includes separate contacts for an alarm circuit that is closed by stepping on the tread.

1,029,676. Electrical Switch. A. J. Gifford, assignor to W. H. Leland & Co., Worcester, Mass. An inclosed switch that permits a conducting plug to be inserted between two clips.

1,029,697. Massage Apparatus. F. R. Kunkel, assignor to Westinghouse Electric & Manufacturing Co. The applicator is driven by an electric motor.

1,029,698. Electric-Railway System. H. W. Leonard, Bronxville, N. Y. The motors may be operated either from a high-tension single-phase trolley or a low-tension direct-current line.

1,029,721. Terminal Fastening. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Has an eye terminal with a pair of internal spring clips.

1,029,723. Electric Cigar-Lighter. D. E. Shea, assignor to D. S. Tinsman, Williamsport, Pa. An ignitible liquid is lighted by short-circuiting line terminals with a resistance in series.

1,029,724. Telephone Repeater. F. J. Shubert, Portland, Ore. Has an artificial line and a set of coils at the relay station.

1,029,728. Railway Signal. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. The motor for operating a semaphore has two independent and reversely wound fields.

1,029,734. Illuminated Sign. P. G. Watmough, Jr., New Brighton, N. Y. Has conical reflectors with incandescent lamps at the edges.

1,029,743. Metering System. F. Conrad and W. M. Bradshaw, assignors to Westinghouse Electric & Manufacturing Co. Two polyphase meters may be connected independently to one of two polyphase sources by a single-phase selector.

1,029,750. Electrical Pendent Switch. H. D. Gortner, Colorado Springs, Colo. Includes a movable member that makes contact with different posts.

1,029,753. Circuit-Interrupter. F. W. Harris, assignor to Westinghouse Electric & Manufacturing Co. Relates to the tripping device for a circuit-breaker.

1,029,770. Operating Device for Street Indicators. P. T. Spindler, assignor to American Street & Station Indicator Co., Chicago, Ill. Is controlled through a contact piece along the trolley wire engaging an elastic contact on the trolley pole.

1,029,787. Electric Arc Lamp for Searchlights, Projectors, and the Like. H. Beck, Meiningen, Germany. The positive electrode of a flaming arc passes through a metal tube that conducts the current to it and also directs a flow of inert gas about the arc.

1,029,811. Signaling Apparatus. E. H. Long, Los Angeles, Cal. Includes a series of polarized electromagnets.

1,029,850. X-Ray Tube. E. W. Caldwell, New York, N. Y. Includes a special target and window construction to intercept undesirable rays.

1,029,851. Incandescent Multiple-Circuit Electric Lamp. C. Carangelo, Cairo, Egypt. Has insulating disks with projections for supporting the filaments.

1,029,861. Electrical Hair and Scalp Treating Instrument. H. C. Folger, Somerville, Mass., assignor to Nu-Vo Manufacturing Co. A comb with an electric heat radiator and circuit connections to the teeth.

1,029,865. Machine for Automatically Manufacturing Welded Wire Chains, Rings, etc. C. L. Graves, assignor to Automatic Welding Machine Co., Bridgeport, Conn. An electric welding machine.

1,029,880. Electromagnetic Instrument. W. K. Menns, assignor to C. H. Pearson, Brookline, Mass. Includes a rotating magnet, an oscillating member and a laminated thermostat.

1,029,885. Electrode for Producing Gas Reactions by Means of the Electric Arc. H. Pauling, assignor to Salpetersaüre-Industrie-Gesellschaft, M. B. H., Cologne, Germany. A water-cooled electrode that permits the part most exposed to the heat to be turned.

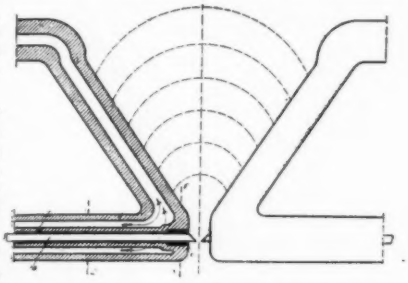
1,029,886. Electric Furnace for Producing Gas Reactions. H. Pauling, assignor to Salpetersaüre-Industrie-Gesellschaft. In the center of the water-cooled electrode is a special longitudinally-movable igniting electrode.

1,029,914. Magneto Interrupter and Timer. C. Cuno, assignor to Connecticut Telephone & Electric Co., Meriden, Conn. For internal-combustion-engine ignition.

1,029,951. Night Sight for Firearms. G. A. Seely, San Francisco, Cal., assignor of one-half to J. Salsbury. Includes a miniature lamp, a battery and contact switch.

1,029,956. Signal Box. N. H. Suren, assignor to Gamewell Fire-Alarm Telegraph Co., New York, N. Y. An alarm box with a signal transmitter, lightning arrester and switch plug.

1,029,965. Process of Electroplating. J. W. Aylsworth, assignor to Thomas



1,029,886.—Starting Electrode for Furnace.

A. Edison, Incorporated, West Orange, N. J. In the electrolyte is finely divided wood pulp which is caused to move over the surface plated and thus burnish it.

1,029,972. Electric Suction Insect Trap. F. M. Britton, Minot, N. D. A housing contains an electric fan, an inlet and several screened outlets.

1,029,974. Controlling Means for Electric Circuits. G. A. Burnham, assignor to S. B. Condit, Jr., Brookline, Mass. A switch for a constant-potential circuit is closed by current of one direction in a constant-current circuit and opened on its reversal.

1,029,980. Insulator. J. Ellis, Salem, Mo. Has a central tapered wire-receiving recess.

1,030,007. Light-Fixture Tripod. W. R. Miller, Southington, Conn. A cup-shaped hanger with an adjustable fixture-stem carrier.

1,030,013. Dynamo-Electric Machine. H. H. Ralston, assignor to Allis-Chalmers Co. and Bullock Electric Manufacturing Co. The commutator bars are slotted at one end with a pin across the slot and a neck fitting over and keyed against the pins.

1,030,025. Thermostatic Device. T. H. Smith, Peekskill, N. Y. A float in a thermometer tube is connected by a rod

to a contact adapted to close an alarm circuit.

1,030,030. Time-Element Circuit-Breaker. H. A. Steen, assignor to Allis-Chalmers Co. A dashpot-retarded relay is operated by two cumulative coils controlled by the main circuit and in turn opens the circuit-breaker.

1,030,036. Sadiron. A. H. Waage and C. P. Waage, Chicago, Ill. Has separate heating units in the toe and heel, one being hotter than the other, and a switch block for interchanging the circuit connections.

1,030,037 to 1,030,039. Automatic Ringing System. A. H. Weiss, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Includes a series of relays that connect the ringing circuit to the called telephone line as soon as the cord connection has been made to it and the busy test shown it to be free.

1,030,040. Switchboard. W. F. Weyrauch, Chicago, Ill. A telephone switchboard with a special arrangement of cord rack.

1,030,041. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Co. A self-starting field winding for synchronous machines comprising a closed secondary with short-circuiting conductors and fan-blade extensions.

1,030,045. Contact Device. E. L. Aiken, assignor to Thomas A. Edison, Incorporated, West Orange, N. J. A rock shaft carries a contact arm adapted to swing against a curved spring contact.

1,030,050. System of Control. L. E. Bogen, assignor to Allis-Chalmers Co. An electrical speed-limit device for rotary machines, includes a vibratory device set in motion when the speed reaches a certain value, the vibratory device then shutting down the machine.

1,030,052. Submarine Illuminating Apparatus. P. J. Byrne, Cleveland, O., assignor of one-third to C. V. W. Walsh. Through a flexible, waterproof sectionalized tube passes a cable to an electric lamp in the bottom section.

1,030,060. Aerial Electric Line. W. Ellingen, Cologne-Lindenthal, Germany. The sag of the different wires in a transmission line is made different so that they cannot possibly swing into contact.

1,030,061. Dynamo-Electric Machine. B. Elshoff, assignor to Bullock Electric Manufacturing Co. Relates to the method of securing connectors to the ends of the commutator bars.

1,030,067. Automatic Burglar Alarm. W. W. Erwin, New York, N. Y. Raising of a window shade opens a closed circuit and thus operates an electric alarm.

1,030,089. Party-Line Telephone System. W. W. Hawkins, Cleveland, O. Provides for selective ringing.

1,030,091. Transformer. J. L. Johnson, assignor to Allis-Chalmers Co. An oil-insulated transformer is cooled by blowing dehydrated air through it.

1,030,093. Electric Rat Trap. L. Karpow, Winnipeg, Canada. A rat stepping between two platforms closes the circuit for a motor that swings an arm to sweep it into a pocket.

1,030,095. Core Structure for Dynamo-Electric Machines. E. R. Knight, assignor to Allis-Chalmers Co. A special construction for induction motors to prevent movement of the laminae.

1,030,101. Lamp Socket. W. S. MacLewee, assignor to C. H. MacLewee, Yardley, Pa. Has a shade-holder directly secured adjacent the socket shell.

1,030,102. Electric Switch. W. S. MacLewee, assignor to C. H. MacLewee, Yardley, Pa. A lamp-socket key.

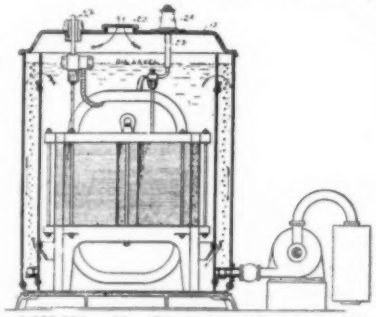
1,030,103. Treatment of Brine. G. W. Malcolm and F. T. Munton, assignors to The Salt Union, Ltd., Liverpool, Eng. Includes a preliminary electrolytic treatment.

1,030,124. Steering-Post Switch. J. G. Perrin, Plattsburg, N. Y. A plunger-type switch mounted on an automobile steering post.

1,030,127. Magneto Ignition Device for Internal-Combustion Engines. C. B. Redrup, Canton, Cardiff, Eng. The armature and field are rotated in opposite directions.

1,030,135. Spark Plug. B. Silfa, New York, N. Y. A conductor is incased in the bushing, but is removable therefrom bodily.

1,030,178. Apparatus for the Electrical Production of Light. P. C. Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Co. A mercury-vapor lamp with an inverted U-shaped tube.



1,030,091.—Air Blast for Oil-Insulated Transformer.

1,030,181. Automatic Side-Tracking Sectionalizer for Electric Transmission Systems. F. C. Hirdler, Oklahoma, Okla. The sections of an auxiliary line can be substituted for corresponding sections of the main line on the maintained abnormal condition of the latter.

1,030,185. Electric Switch. A. Jacobson, Lanesville, Mass. A double-throw switch with independent knife blades on the two sides.

1,030,195. Motor Controller. A. J. Loguin, assignor to Allis-Chalmers Co. Includes a pair of latches, one of which acts as a no-voltage release.

1,030,196. Burglar Alarm. G. H. Lucier, St. Paul, Minn. Unlocking a door-lock bolt closes the alarm circuit.

1,030,197. Selective Signaling System. J. McFell, Chicago, Ill. A train-dispatching selector with a polarity changer at the source and polarized station signals.

1,030,207. Electric Switch. J. J. Rawlings and G. Sweetser, London, Eng. A thermostatic switch with a bow-shaped expansible arm about which is wrapped an insulated heating coil.

1,030,240. Mechanism for Electrically Transmitting and Reproducing Images. G. E. Hoglund, Chicago, Ill., assignor of one-half to W. N. Selig. Includes a selenium cell and shutter at the transmitting and receiving stations, the shutters being synchronously rotated.

1,030,243. Ignition Device for Explosive Engines. C. T. Mason, Sumter, S. C. A magneto with an oscillating armature.

1,030,262. Gas or Vapor Electric Apparatus. P. C. Hewitt and N. W. Rogers, assignors to Cooper Hewitt Electric Co. A mercury-vapor lamp has a starting electrode which can be temporarily connected to the negative electrode of the lamp.

Patents that Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired June 25, 1912.

541,459. Combined Insulator and Fuse-Holder. C. F. Scott, and H. P. Davis, Pittsburgh, Pa.

541,460. Electrical Arc Lamp. A. W. Smith, Washington, D. C.

541,467. Method of Preventing Electrolysis of Pipes Under Ground. H. P. Brown, New York, N. Y.

541,471. Electromagnet. F. B. Corey, Boston, Mass.

541,491. Repairing Incandescent Lamps. J. Mohrle, Munich, Germany.

541,497. Electric Elevator Apparatus. F. B. Perkins, Boston, Mass.

541,500. Electrical Controller for Motors. O. H. Piefer and A. F. Piefer, San Jose, Cal.

541,505. Code-Signaling Device. W. Rymer, Detroit, Mich.

541,515. Self-Neutralizing Flexible Conductor for Transmitting Motion to Movable Objects. B. W. Warwick, London, Eng.

541,541. Carbon Electrode for Electric Arc Lamps. S. Heimann, New York, N. Y.

541,542 and 541,543. Automatic-Working Rheostat for Starting Electric Motors. F. E. Herdman, Winnetka, Ill.

541,544. Electric Motor. F. E. Herdman, Winnetka, Ill.

541,545. Electric Brake-Controller. F. E. Herdman, Winnetka, Ill.

541,549. Automatic Electric Gas-Lighter. W. N. Jaskey and E. S. Else, Logan, Utah.

541,552. Protector-Casing for Underground Electric Conductors. J. A. Kingdon, London, Eng.

541,581. Shuttle-Actuating Mechanism for Looms. W. Weaver, Norwalk, Conn.

541,603. Electric Arc Light. E. A. Edwards, Cincinnati, O.

541,604. Alternating-Current Motor. R. Eickemeyer, Yonkers, N. Y.

541,608. Electric Switch. W. P. Hancock, Everett, Mass.

541,615. Transmission of Power By Alternating Currents. F. S. Hunting, Fort Wayne, Ind.

541,643. Jacquard Mechanism for Weaving Double-Faced Fabrics. W. Weaver, Norwalk, Conn.

541,644. Jacquard Mechanism for Looms. W. Weaver, Norwalk, Conn.

541,646. Jacquard Mechanism for Looms. W. Weaver, Norwalk, Conn.

541,723. Electric Gas-Lighter. J. L. Creveling, New York, N. Y.

541,724. Thermo-Controlled Electrical Heater. L. E. Custer, Dayton, O.

541,730. Conduit Electric Railway. E. Ebi, Cedar Rapids, Ia.

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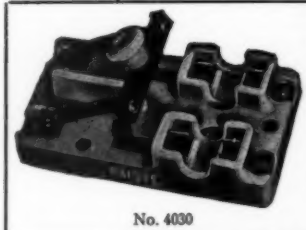

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Fig. 2 shows the same receptacle with the brass shell removed and a screw driver inserted to illustrate the ease of reaching the contact terminal plate.

The screws of this terminal plate are long and are upset so it is not possible for them to fall out.

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Fig. 1

Fig. 2

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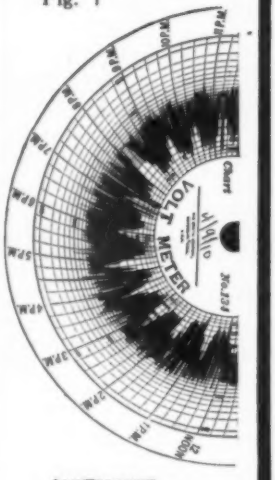
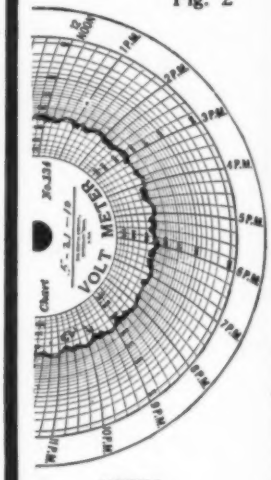
Fig. 1



WITHOUT STORAGE BATTERIES

Fig. 2



WITH STORAGE BATTERIES

Load Regulation by Means of Storage Batteries

From an Article by J. H. Tracy

Fig. 1 shows the voltage at the end of a railway feeder without a storage battery. Fig. 2 shows the same feeder line under exactly similar conditions but with a battery connected across the line. The lesson applies equally well to power plant service and is well worth attention.

Fig. 2 represents most desirable conditions, the battery serving to reduce fluctuations in voltage due to resistance drop of the feeders, to reduce fluctuations on the power house itself and to carry its share of the load at peak periods.

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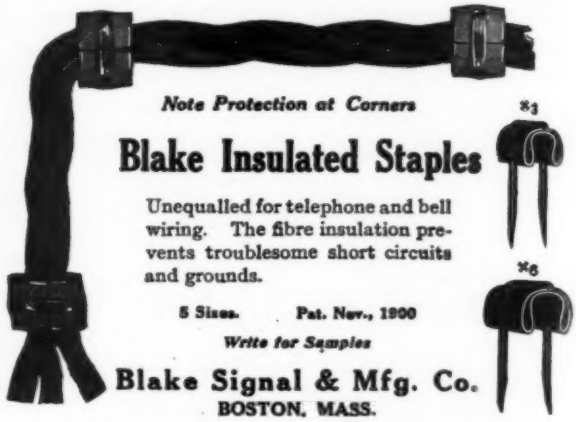

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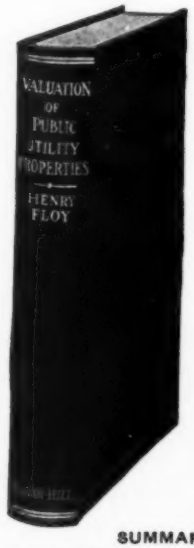

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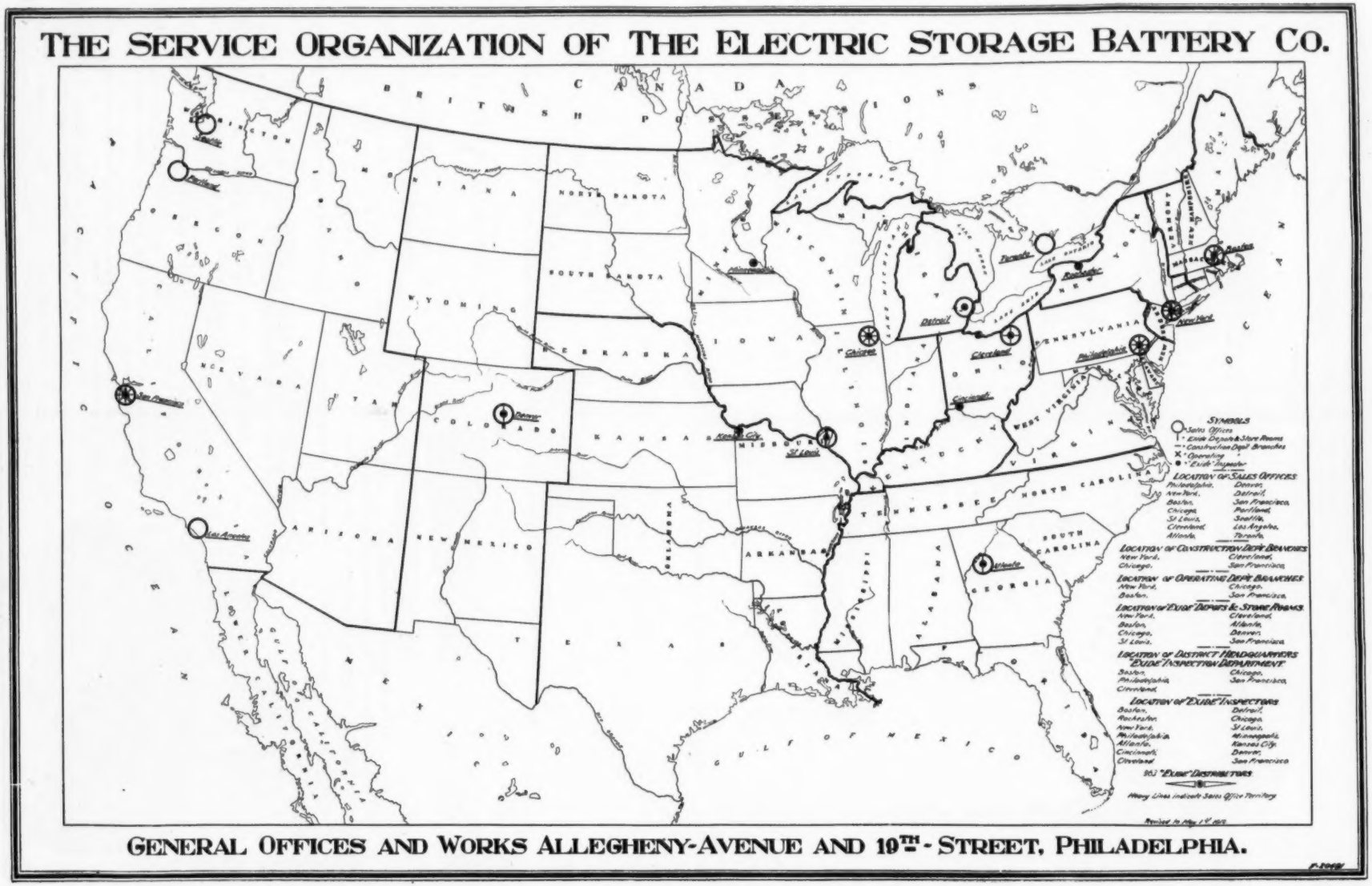

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The Underwriters' Laboratories, under the provision of the National Electrical Code, require a 600 volt fuse to operate satisfactorily on short circuit tests of 300 kilowatts. But 600-volt

"NOARK" Enclosed Fuses

successfully withstand a test of 19,250 kilowatts; 64 times as severe as the "N.E.C.S." requirements. This remarkable showing is made possible by the "NOARK" multiple link construction, the vent screens and the excellence of the fuse filling material.

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THE STANDARD
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ROXITE

Heat Resisting Moulded Insulation

It will not soften at any temperature.
Can be moulded into any form.
Metallic inserts can be moulded in place.
It is unaffected by oils or water.
It will not support combustion.
It is hard and will take a high polish.
It has a high dielectric and also great tensile strength.

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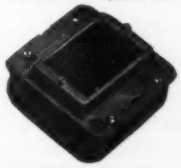

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SPECIFIC RESISTANCE EQUAL TO MERCURY
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The Highest Degree of Efficiency and Durability
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3¾ inches high, 4¾ inches diameter.

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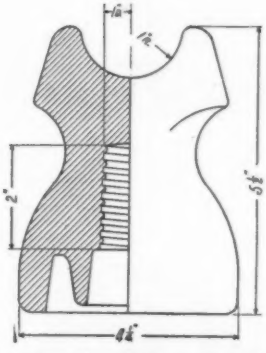

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High and Low Voltage Insulators

Mechanical Strength
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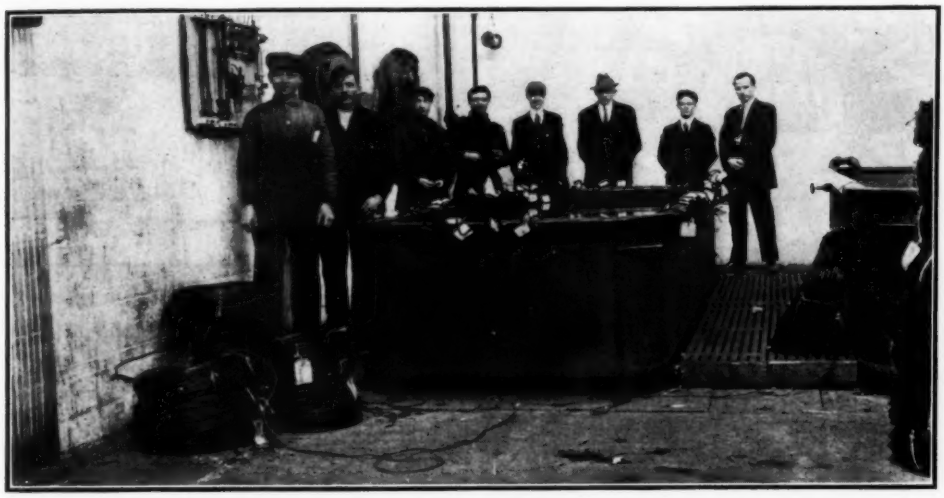

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1. Ruby Core exceeds New Code requirements by 100 per cent.
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4. We make nothing but wire and cables; unlike rubber insulators who put out a diversified line, we do not have to reclaim and use for wire insulating the waste and refuse of tires, boots, etc.

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THE SAFETY INSULATED WIRE & CABLE CO.

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No Change Was Necessary

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have always exceeded the requirements of the Underwriters and are time-tried products worthy of your consideration.

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JORDAN TAP-ON
No-90-With cover in position

Approved by Underwriters

In position on moulding line

Facilitates and improves the making of branch taps in wood moulding.
For two or three wire branches or any combination thereof.
Indispensable to good work.

Brass contacts are liberally designed; wire once placed under binding screws cannot slip off contact plate or be removed without loosening binding screw.

Porcelain cover so arranged that capping extends under same, allowing capping to be installed on moulding before cover of Tap-On is placed in position.
Write for illustrated catalogue.

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"A TYPE FOR EVERY USE"

1½" Flush Receptacle

Diamond Switches

Switches—Push Button, Rotary Flush, Rotary Surface, Automatic Door, Flush Receptable—are better switches because:

Easiest to wire; very durable for the reason that wearing parts are of blued, case-hardened steel; rapid make and break; spring temper phosphor bronze contacts big enough to carry any reasonable overload; sheet mica insulation.

The "DIAMOND H" Switch Book describes the full line—may we send it to you?

The Hart Manufacturing Company

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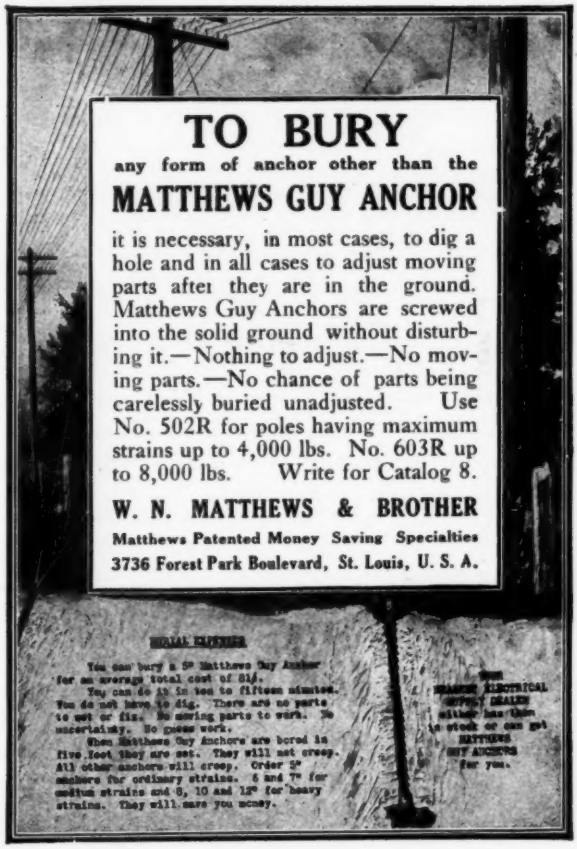

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any form of anchor other than the

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it is necessary, in most cases, to dig a hole and in all cases to adjust moving parts after they are in the ground. Matthews Guy Anchors are screwed into the solid ground without disturbing it.—Nothing to adjust.—No moving parts.—No chance of parts being carelessly buried unadjusted. Use No. 502R for poles having maximum strains up to 4,000 lbs. No. 603R up to 8,000 lbs. Write for Catalog 8.

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Why use resinous compounds when Bakelite

IMPREGNATED COILS

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Withstands oils, steam, solvents and chemicals. High Dielectric Strength. Ask us about other applications.

GENERAL BAKELITE CO.

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[By The Associated Press.]

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Toles was on a pole making a repair on an interurban line when a chain thrown over the wire by a companion swung against him. A pole strap kept him from falling and he hung unconscious. He was revived soon after being rescued and, aside from burns, is not severely injured

THE LINEMAN'S LIFE

may depend upon his equipment.

DON'T BE SATISFIED

with anything but the best.

KLEIN EQUIPMENT STANDS THE TEST OF TIME—THEREFORE IS SAFE

Sold by all electrical supply and larger hardware dealers.

Send for our catalogue and in ordering insist on

KLEIN'S

Mathias Klein & Sons

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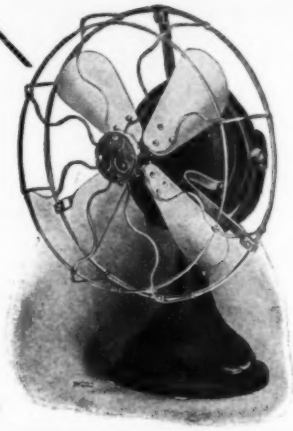

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Portable Lamps	Luminous Radiators	Hylo Lamps	Sockets
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Miniature, Decorative, Tungsten and Carbon Lamps

Commonwealth Edison Company

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Emerson Fans Shipped Promptly

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Emerson oscillators have two successful seasons behind them—no untried features in their design.

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Wherever the "Sailor Girl" is Displayed You Will Find Diehl Fans.

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Oshkosh Mfg. Company

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Inexpensive, reliable and efficient telephone systems for residence, factory or business establishments.

Splendid Sellers

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This type gives common talking and selective ringing — the **selective ringing** feature enables one to call any station in the system without disturbing the other and **common talking** which permits of but one conversation being carried on at a time.

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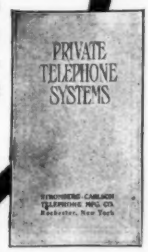

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Ball bearings permit close adjustments.

All operations controlled from the keyboard.

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Direct Current Watthour Meters

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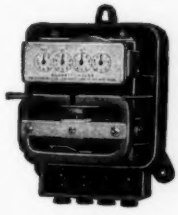

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Transformers For all Purposes

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Ten long years we have experimented.

Today you have the sum total in the Corinthian Standard.

NOW YOU KNOW! One

Flour City Ornamental Iron Works

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WESTERN ELECTRIC CO., Selling Agents

Sell this Better Electric Iron to every "Lady of the House" on your lines.

No. 36B

Other Central Stations are boosting their day loads by putting out this practical and efficient household iron.

"DELCO" Sad Irons

give perfect satisfaction, because they are economical, always ready for use, guaranteed for two years, and are equipped with a fool-proof three-heat switch which allows absolute heat control. When the bottom of the iron is "Hissing Hot" the top is comparatively cool—the heat is not wasted. This particular style retails for $7.50, is furnished with cord and plug and is adaptable to direct or alternating current. Other styles for special uses described in "DELCO" Devices Booklet. Send for it.

DIAMOND ELECTRIC CO.

Makers of "DELCO" Electrically Heated Devices

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The lamp without a shadow

This clear glass tube with a single *straight* filament, 12 inches long, forms an absolutely unique incandescent lamp, unequaled for *all* kinds of illumination. The contacts are *behind* the filament. No end sockets or attachments check the course of the light. The Rayline is thus the *only* lamp which produces a totally unbroken cord of light of any desired length, giving shadowless, absolutely uniform, strong and mellow illumination.

And when you tell your customers that the Rayline burns at the most but *one-half the current* required by standard bulb lamps for the same illumination and lasts longer, isn't it certain to be your *one best seller?*

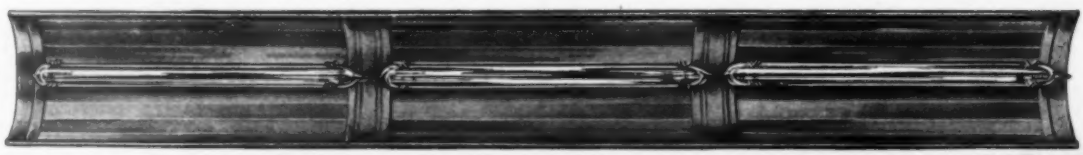
The Rayline Lamp

"NO SHADOW"

The complete line of Rayline fixtures apply this remarkable lamp to all commercial, office, factory, store, sign board, home, and decorative illumination. **Write for booklet today.**

Straight Filament Lamp Company, 125 West 42d Street, New York

Rayline Lamps ganged in patented Rayline Reflector, which can be extended to any length.



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New Model No. 197

The EXCELLO FLAMING ARC LAMP

Is recognized as the Standard of light units of the flame type. It is the best designed, the best constructed, the best finished, the most efficient in operation, and the least expensive in maintenance costs of any flame lamp yet produced.

The use of *Excello Carbons* assures the maximum of illumination, uniform and constant service.

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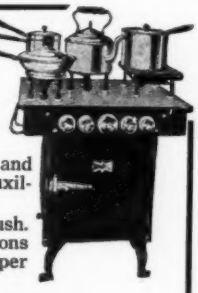
? Are You Taking Advantage ? of the Increasing Demands for Simplex Electric Ranges



Especially desirable in summer homes and apartments or in every household as auxiliary to the coal range.

Number Five is a good size for you to push. It will do all the cooking for 4 or 5 persons at a cost of less than a kilowatt per day, per person.

Write for the story of Number Five

Simplex Electric Heating Co.

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The Advance Lamp Tester Will Show You

the current consumption (in either amperes or watts) of the Tungsten, Carbon, or other incandescent lamps. Quick to use and accurate.

Send for circular and price

Eldredge Electric Mfg. Co.
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Commonwealth Cat. No 3504

Note the Simple Lines

Easy to keep clean; easy to paint. In every way more artistic than heavy ornamentation.

Note the Slender Column

It neither obstructs vision from the street nor from the sidewalk.

Note the Base—

Heavy enough to harmonize with the column but does not occupy too much space on the sidewalk.

Note the Height—

To the top of the center globe it is just 14 ft. 3 in., low enough to give proper diffusion on sidewalks and store fronts, yet high enough not to interfere with view of windows from the streets.

Note the Spread of the Arms—

Thirty-six inches from center to center of opposite globes.

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"COMMONWEALTH"

For the Central Station interested in the modern "Better-Street-Lights-For-Our-Town" movement, we have a proposition of interest. Twenty-three years of our business life have been devoted to the making of street lighting devices. Those years of experience have taught us how to create sentiment in a community for better lighting, how to crystallize that sentiment into action and how to help the Central Station to boost load factor and profits by ornamental lighting installations.

Our advertising department issues special literature for special prospects. We will furnish any required quantity free. You distribute it and note results.

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One Large Electric Truck Consumes More Current Than A Whole Block of Residences
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Why Not Cut the Cost of Delivering Beer?
Consider the Installation of Electric Trucks
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An Electric is the Car of Prestige
What Would You Think?
In the Fashion Centres of the World
When a Patient Says to You— "Doctor, What Machine Should I Buy?"
An Electric is the Car Desirable
Reduce Your Haulage Cost

Here Are Some of the Ads That Will Sell Electric Vehicles for Your Benefit

Over 13,000,000 people are reading these and similar advertisements every month, Mr. Central Station Manager. Over 13,000,000 readers of 36 magazines are being convinced that the Electric Vehicle—pleasure and commercial—is superior for many kinds of service. Lots of these people are right in your own territory—intelligent readers who can afford to buy Electric Vehicles. And they ***will*** buy Electric Vehicles if ***you*** give Electric Vehicles their due support.

You Know the Advantages of Electric Vehicles —Why Not Tell Others About Them?

You realize that every Electric Vehicle sold in your territory means additional revenue for you. You also know that the charging of Electric Vehicles means an elimination of costly off-peak periods. But if you, Mr. Central Station Manager, do not boost Electric Vehicles, you cannot expect our national publicity to bear fruit in your locality. If you use Electric Vehicles other concerns will follow your lead. They will use them if they see that you have faith in them. And you will really find Electric Delivery Service extremely serviceable and economical for your own purposes.

Our special plan for securing an Electric Vehicle charging business for Central Stations is at your disposal. It will show you how your Central Station can become part and parcel of our nation-wide campaign. Send for it today before you forget.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA

BOSTON **NEW YORK: 124 W. 42nd St.** [29] **CHICAGO**

Mercury Floated Moving Elements

Absorb Shocks and Jars

Electric Vehicle Service demands this safeguard.

Why not secure the same advantage for your Switchboard Meters?

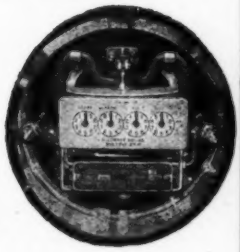
"Built Like a Watch"

Is it not logical?

"Built Like a Watch"

Sangamo D. C. Meters

operate from shunts, and materially reduce switchboard costs. Are you getting the benefits of this feature?



Every man designing switchboards will eventually use Sangamos. Why not start today?

Ask for Bulletin 16

SANGAMO ELECTRIC CO.

SPRINGFIELD, ILL.

CHICAGO
617-631 JACKSON BLVD.

SANGAMO

NEW YORK
50 CHURCH STREET

SELLING AGENTS

Electric Appliance Co., Chicago, San Francisco, Dallas, New Orleans
Wesco Supply Co., St. Louis, Fort Worth and Birmingham
Wetmore-Savage Company, Boston Ludwig Hommel & Co., Pittsburg
Rumsey Electric Co., Philadelphia, Pa.
Alfred Collyer & Co., Montreal

Lighting Small Towns

¶ Where it is necessary to install comparatively small street lighting systems, the Pittsburgh Automatic Series Mazda Equipment has certain peculiar advantages possessed by no other type.

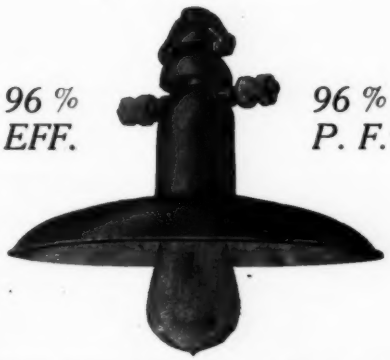
¶ For instance, assume that a certain installation required but thirty 40 C. P., 4 ampere, 11.8 volt series Mazda lamps. The total voltage of the lamps would be but 354 volts, which potential would not break down the ordinary film cutout used with the regulator system.

¶ The above problem would easily be solved with the Pittsburgh System, in which the film cutout is replaced with a regulating coil mounted in the reflector hood shown below.

¶ Aside from eliminating the most unreliable element, the film socket, the Pittsburgh also insures a higher efficiency, higher power factor and longer lamp life.

Mazda Unit

96 % EFF.



96 % P. F.

Pittsburgh Automatic Series Street Lighting System

¶ Every central station manager contemplating the lighting of small towns, or residential districts of cities, should investigate this new system. It is designed to and will solve the problem.

¶ The Pittsburgh System can also be used with single or multiple lamp post lighting, any number of lamps being controlled as desired, either manually or by time switches.

¶ Send us data as to the number of lamps you wish to operate, the primary voltage of the system, the approximate length of circuit, and our engineers will give you their recommendations.

¶ Have you received our catalog?

PITTSBURGH TRANSFORMER COMPANY

PITTSBURGH, PA.

SALES AGENTS

Delta-Star Electric Co., Chicago
Rumsey Electric Co., Philadelphia
Inter-state Electric Co., New Orleans
A. Hall Berry, New York
Pettingell-Andrews Co., Boston
Iron City Electric Co., Pittsburgh
Monarch Electric Co., Kansas City
General Machinery Co., Birmingham

Annual Convention

of the

National Electrical Contractors' Association

Denver, Colorado
July 16-19, 1912

The issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of July 13th will be distributed on the special trains going to and during the Convention. It will contain a strong department devoted to electrical construction, which will appeal particularly to contractors, and it will have some special features that will make it a specially valuable issue for them. It will afford manufacturers an excellent opportunity for the use of big space to reach the real buying element of the electrical construction field.

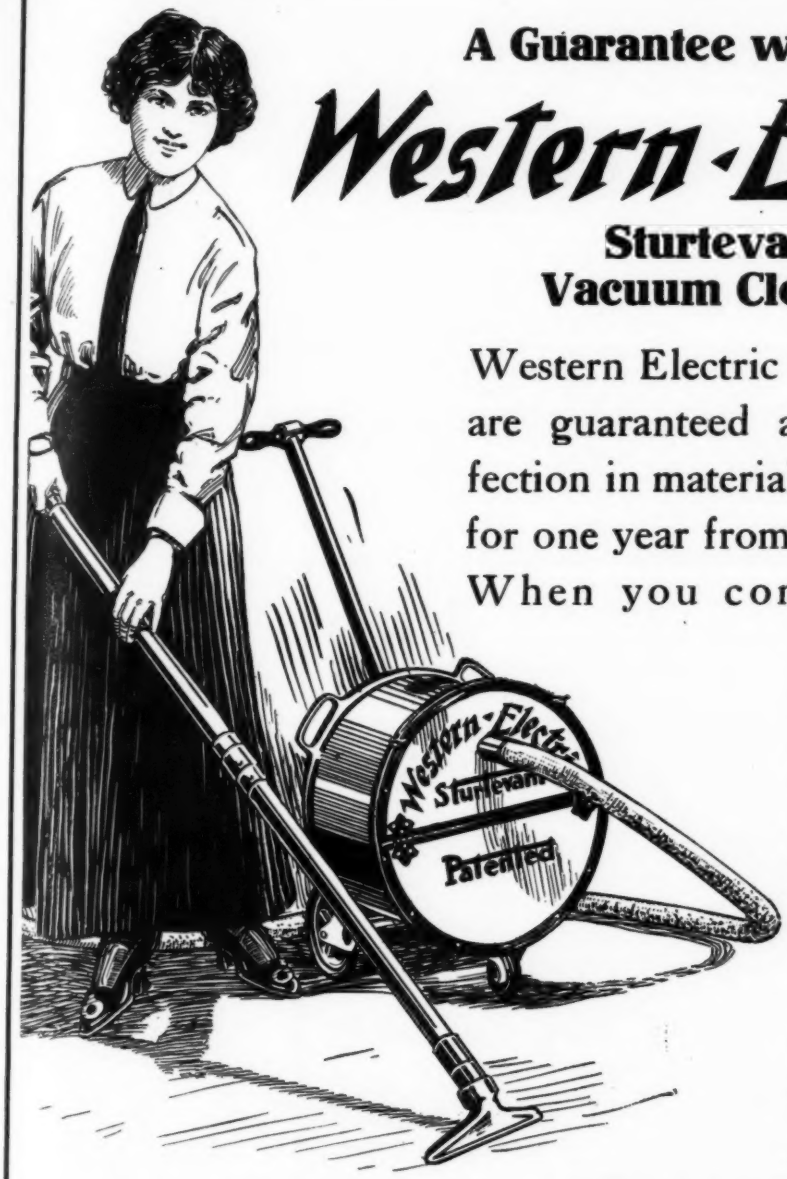
The ELECTRICAL REVIEW AND WESTERN ELECTRICIAN has the biggest Contractor and Dealer Circulation of any Publication in the Field

Forms will close July 8. Our Art and Copy Department will assist in the preparation of your advertisement.

Electrical Review and Western Electrician

608 South Dearborn Street, Chicago

New York, 13 Park Row Detroit, Buhl Block



A Guarantee with every

Western-Electric

Sturtevant Vacuum Cleaner

Western Electric Vacuum Cleaners are guaranteed against all imperfection in material or workmanship, for one year from date of shipment. When you consider that the motors are the famous Western Electric motors, and the Cleaners, the well known Sturtevant Vacuum Cleaners, you will realize why we can afford to extend this guarantee. They stay sold. They make friends for you.

Write Dept. 3-G for Our Agency Proposition.

Western Electric Company

Manufacturers of the 6,000,000 "Bell" Telephones

New York	Chicago	Kansas City	San Francisco	Montreal	London
Buffalo	Milwaukee	Oklahoma City	Oakland	Toronto	Berlin
Philadelphia	Pittsburgh	Minneapolis	Los Angeles	Winnipeg	Paris
Boston	Cincinnati	St. Paul	Dallas	Calgary	Rome
Richmond	Indianapolis	Denver	Seattle	Vancouver	Johannesburg
Atlanta	St. Louis	Omaha	Portland	Antwerp	Sydney
Savannah			Salt Lake City		Tokyo

EQUIPMENT FOR EVERY ELECTRICAL NEED

THOMAS QUALITY RELIABILITY

Thomas Porcelains

Weld Clad

Trade Mark
Copper Clad Steel Wire

TRADE FA MARK

Switches

D&W REG. U.S. PAT. OFF.

D. & W. Fuse Co.'s Enclosed Fuses

ELECTRA

Arc Lamp Carbons

BRYANT SUPERIOR WIRING DEVICES

Bryant Sockets and Products

Western Electric

Motors, Generators, Arc Lamps, Fans, Batteries, Annunciators, Bells, Soldering Compounds, Transformers, Mazdaliers, Buffalo Grips, Ozonators, Vacuum Cleaners, Switchboards, Rectifiers

Victor Tape, Amazon Tape, Insulating Materials, Lamp and Portable Cords

TRADE MARK

"Chloride Accumulator"

REGISTERED SEPTEMBER 11, 1894

Storage Batteries

REAL QUALITY MARKS

Products bearing these trade marks are backed by the

Western Electric Company

Because each is the "Sterling" of its line.

Western Electric Company

Manufacturers of the 6,000,000 "Bell" Telephones

"SAME TYPE AND FREIGHT" New York, Buffalo, Philadelphia, Boston, Pittsburg; Atlanta, Chicago, Indianapolis, Cincinnati, Minneapolis; St. Paul, Milwaukee, Saint Louis, Kansas City, Denver; Dallas, Omaha, Oklahoma City, San Francisco, Oakland; Los Angeles, Seattle, Salt Lake City, Portland; "SAME TYPE AND FREIGHT"

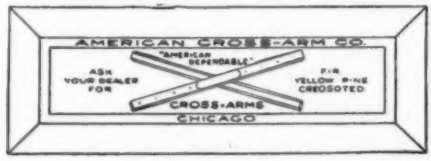
Montreal, Antwerp, London; Toronto, Berlin, Paris; Winnipeg, Johannesburg; Vancouver, Sydney, Tokyo

Address the house nearest you.

"EQUIPMENT FOR EVERY ELECTRICAL NEED"

TRADE FARADAY MARK

Skeleton and Enclosed Signal Bells



Fir Cross-Arms

BLACK CORE PARAC RUBBER WIRES

Wires and Cables

SUNBEAM

"Nature Smiles Through Sunbeams"

"O.K." LINE AND HOUSE WIRES

Wires and Cables

EXCELLO

Arc Lamp Carbons

CH

Condulets and Condulet Fittings

PERKINS SUPERIOR WIRING DEVICES

Perkins Electrical Specialties

T. N. B. COPPER CO. ELECTRICAL DEPT. TRADE MARK AMERICA REG. U.S. PAT. OFF.

"Hill" Switches, Panel Boards, Cabinets

Western Electric

Motors, Generators, Arc Lamps, Fans, Batteries, Annunciators, Bells, Soldering Compounds, Transformers, Mazdaliers, Buffalo Grips, Ozonators, Vacuum Cleaners, Switchboards, Rectifiers

Victor Tape, Amazon Tape, Insulating Materials, Lamp and Portable Cords

HABIRSHAW WIRES CABLES AND CORES.

Rubber Covered Wires and Cables

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE.

Bristol's Recording Instruments

THE TUNGSTOLIER CO'S SCIENTIFIC ILLUMINATION MAZDALIER IF IT ISN'T A MAZDALIER IT IS NOT A TUNGSTOLIER

Mazda Lamp Fixtures

You Are Sure of the Best in Each Line when you buy goods backed by these trade marks.

Make them *your* standard.

Write Dept. 3-J for prices.

Western Electric Company

Manufacturers of the 6,000,000 "Bell" Telephones

"SAME TYPE AND FREIGHT" New York, Buffalo, Philadelphia, Boston, Pittsburg; Atlanta, Chicago, Indianapolis, Cincinnati, Minneapolis; St. Paul, Milwaukee, Saint Louis, Kansas City, Denver; Dallas, Omaha, Oklahoma City, San Francisco, Oakland; Los Angeles, Tacoma, Salt Lake City, Portland "SAME TYPE AND FREIGHT"

Montreal, Antwerp; Toronto, London, Berlin; Winnipeg, Paris, Johannesburg; Vancouver, Sydney, Tokyo

Address the house nearest you.

"EQUIPMENT FOR EVERY ELECTRICAL NEED"

KLEIN TOOLS EST. 1857 TRADE MARK REG.

M. Klein & Sons Lineman's Tools

THE FIBRE CONDUIT CO. REG. U.S. ORANGEBURG PAT. OFF. ORANGEBURG, N.Y.

Underground Conduit

Brookfield Standard Glass Insulators

1872 EDWARDS

Edwards & Co., Inc., House Goods

TRADE ELECTROSE MARK REG. U.S. PAT. OFF. & FOREIGN COUNTRIES.

Insulated Material for Electric Railways and Mines

MANF'D BY G.R.L.CO.

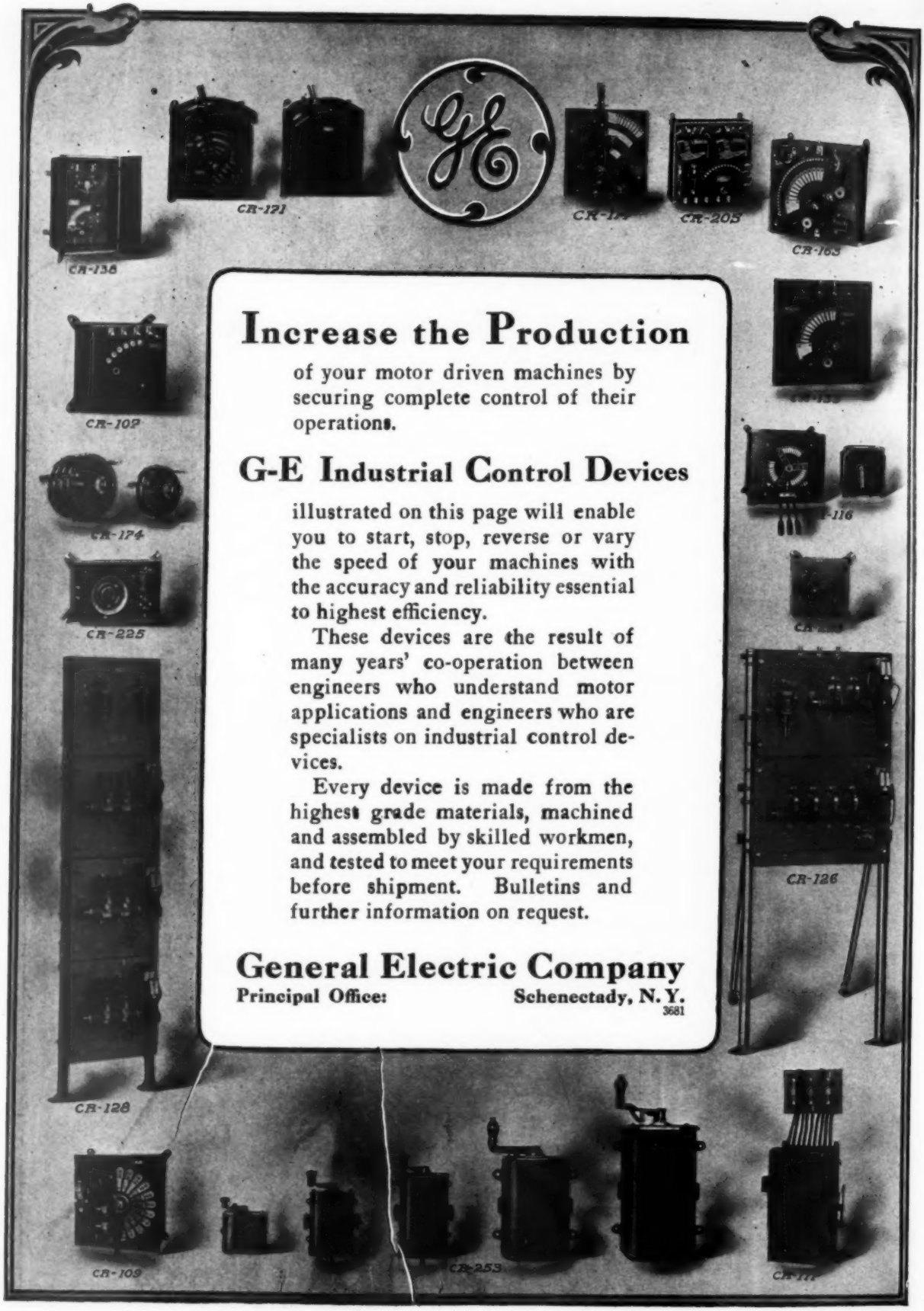
Lamp and Portable Cord

Weston Electrical Measuring Instruments

BUFFALO-GRIP No. 1 Trade Reg. U. S. Mark Pat. Off.

Wire Grips

Hemingray Glass Insulators



Increase the Production

of your motor driven machines by securing complete control of their operations.

G-E Industrial Control Devices

illustrated on this page will enable you to start, stop, reverse or vary the speed of your machines with the accuracy and reliability essential to highest efficiency.

These devices are the result of many years' co-operation between engineers who understand motor applications and engineers who are specialists on industrial control devices.

Every device is made from the highest grade materials, machined and assembled by skilled workmen, and tested to meet your requirements before shipment. Bulletins and further information on request.

General Electric Company

Principal Office: Schenectady, N. Y.

3681

The Popularity of "The Guaranteed Iron"

The absolute reliability of the G-E Iron, the guarantee behind it, the name behind the guarantee and continuous, nation-wide publicity make easy local sales.

It is easy to sell a well known article of excellence like "The Guaranteed Iron" simply by letting the public realize that you handle it and are pushing its sale.

"Progressives" everywhere are profiting by sales-compelling local campaigns.

The Commonwealth Edison Company of Chicago has just placed an exclusive order for 10,000 Flatirons bearing the big, red G-E Guarantee Tag. These will be sold on the free trial basis—dollar a month payments—by means of local advertising of "The Guaranteed Irons."

General Electric Company

Principal Office: Schenectady, N. Y.

3675

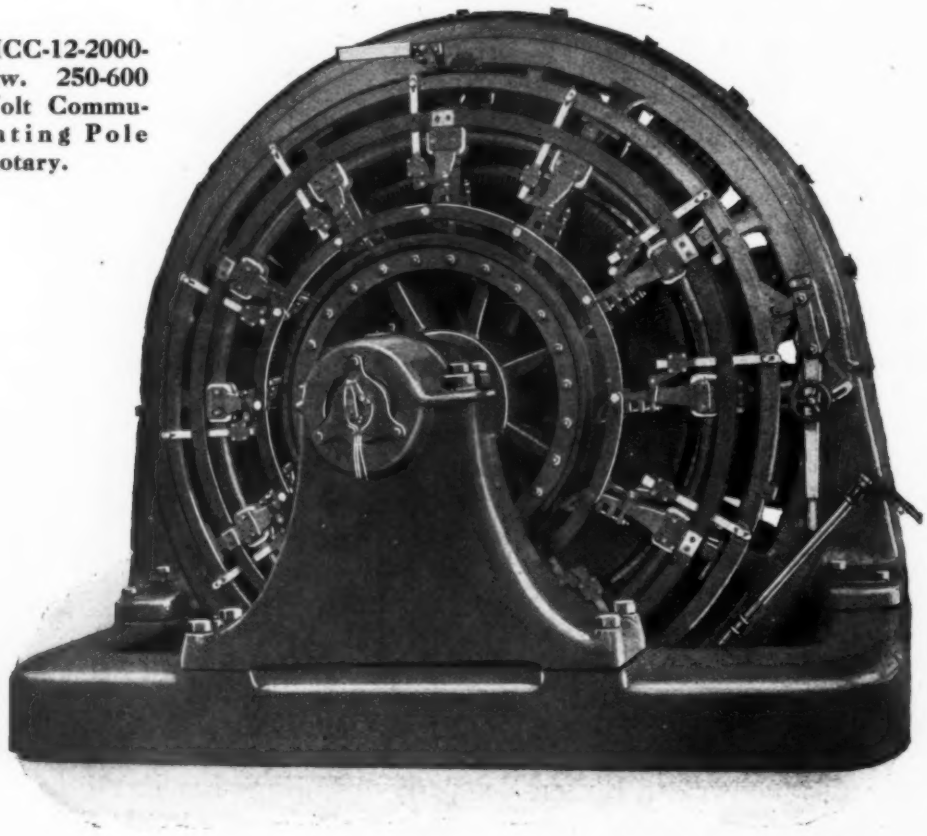
The Guarantee of Excellence — GE — on Goods Electrical

Rotary Converters

The Commutating Pole Rotary Converter

developed and introduced by the General Electric Company over two years ago, has revolutionized substation practice through its ability to commutate the peak loads and provide a high all-day efficiency with minimum floor space and minimum first cost. A few of these rotaries which are in use on some of the largest and most important installations in the country are shown on these pages.

HCC-12-2000-Kw. 250-600 Volt Commutating Pole Rotary.



These rotaries will carry 150% normal load for two hours, 200% load for one-half hour and 300% momentary loads.

General Electric Company

Largest Electrical Manufacturer in the World

Principal Office: Schenectady, N. Y.

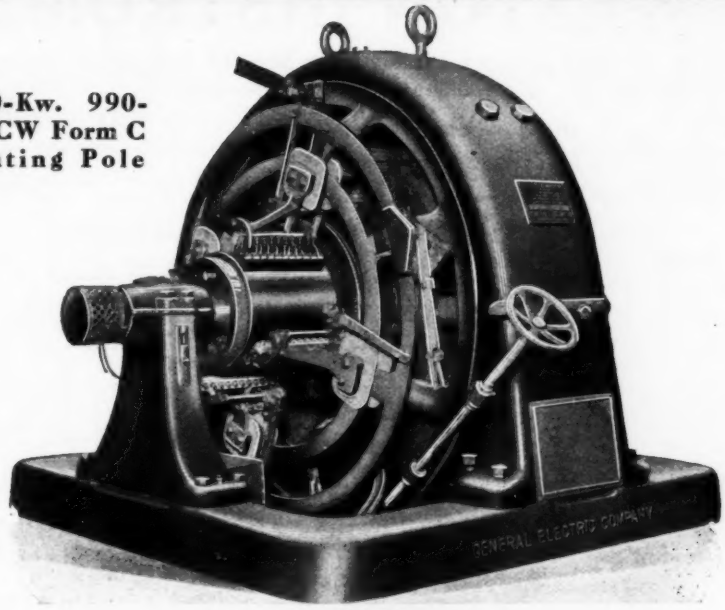
3620

Sales Offices in All Large Cities

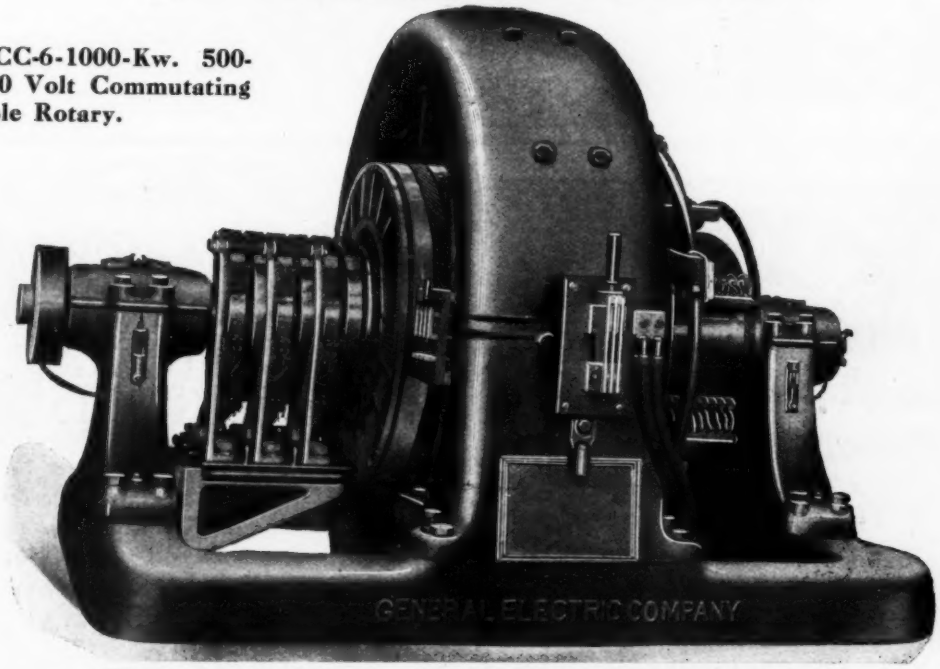
The Guarantee of Excellence — GE — on Goods Electrical

Rotary-Converters

TCC-4-500-Kw. 990-1200 Volt CW Form C Commutating Pole Rotary.



HCC-6-1000-Kw. 500-600 Volt Commutating Pole Rotary.



These rotaries will carry 150% normal load for two hours. 200% load for one-half hour and 300% momentary loads.

General Electric Company

Largest Electrical Manufacturer in the World

Principal Office
Schenectady, N. Y.

Sales Offices in
All Large Cities

3620

The Guarantee of Excellence on Goods Electrical

NEW WESTON INSTRUMENTS

A Full Line of Alternating Current Switchboard Indicating Instruments
is offered by this Company, comprising

WATTMETERS, Single and Polyphase
POWER FACTOR METERS
SYNCHROSCOPES

FREQUENCY METERS
VOLTMETERS
AMMETERS

and New Models of Weston D. C. Instruments to match

This whole group of instruments embodies the results of several years' exhaustive study and scientific investigation of all the complex electrical and mechanical problems involved in the development of durable, reliable, sensitive and accurate instruments for use on alternating current circuits.
Every detail of each of these instruments has been most carefully studied and worked out so as to be sure that each shall fully meet the most exacting requirements of the service for which it is intended. Neither pains nor expense has been spared in the effort to produce instruments having the longest possible life, the best possible scale characteristics, combined with great accuracy under the most violent load fluctuations, and also under the many other trying conditions met with in practical work. Every part of each instrument is made strictly to gauge and the design and workmanship and finish is of the highest order of excellence.
We invite the most critical examination of every detail of each member of the group. We also solicit the fullest investigation of the many other novel features and very valuable operative characteristics of these new instruments and request a careful comparison in all these respects with any other make of instrument intended for like service. We offer them as a valuable and permanent contribution to the art of electrical measurement. Their performance in service will be found to justify the claim that no other makes of instruments approach them in fitness for the service required from A. C. Switchboard indicating instruments.
Full particulars of design, construction, prices, etc., are given in Catalogue R-16. Write for it.

Weston Electrical Instrument Co.
Waverly Park, Newark, N. J.

New York, 114 Liberty St.
Chicago, 1504 Monadnock Block.
Boston, 176 Federal St.
Philadelphia, 342 Mint Arcade.
Birmingham, Brown Marx Bldg.
Detroit, 44 Buhl Block
St. Louis, 915 Olive St.
Denver, 231 Fifteenth St.
San Francisco, 682 Mission St.
New Haven, 29 College St.
Cleveland, 1522 Prospect Ave.
Paris, 12 Rue St. Georges.
Berlin, Genest St. 5, Schoenberg.
Mexico, 2a Capuchinas 40.
London, Audrey House, Ely Pl., Holborn
Toronto, 76 Bay St
Montreal, Winnipeg, Vancouver, Calgary } The Northern Electric & Manufacturing Company

OKONITE
TRADE MARK
REG. U.S PATENT OFFICE.

The STANDARD *for* RUBBER INSULATION

THE use of **Okonite** Insulated Wires stamps you as a wise and discriminating buyer. They are permanently reliable.

The Okonite Co.
New York

Insulated WIRES and CABLES

PARANITE

RUBBER COVERED WIRES

are made to meet all requirements of New Code Specifications

Underground, Aerial, Submarine and inside Use. Telephone, Telegraph, Fire-Alarm, Electric Light and Power, Wires and Cables

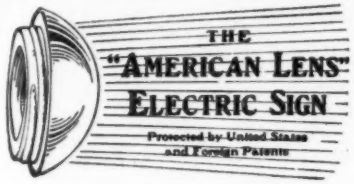
"The Best For Every Purpose"

Indiana Rubber & Insulated Wire Co
Jonesboro Indiana

AMERICAN CROSS-ARM CO.

CHICAGO

EFFICIENCY - DURABILITY - BEAUTY - ECONOMY



See the screw base. Locked tight. No rattle. Weather proof. We own the patent obtained from the original application for this lens sign. Decreed good and valid by United States Circuit Court, District of Indiana, on Aug. 16, 1911.

SAVES 80% READS FARTHER

No Blurring of Letters

GREATEST EFFICIENCY, LEAST OPERATING EXPENSE A NEW ONE

All steel construction, baked enamel finish in any color.
Wired according to underwriter's requirements.
CLASSY and EFFECTIVE.
Of particular interest to good advertisers.
TELL US WHAT YOU WANT
Your Ideas or Ours
Sketch and price furnished promptly

This double-faced "American Lens" Electric Sign, 2 ft. wide, 7½ ft. long, 12-inch illuminated letters.

Costs only 2 cents per hour

for current using eight 25-Watt Tungsten Lamps.

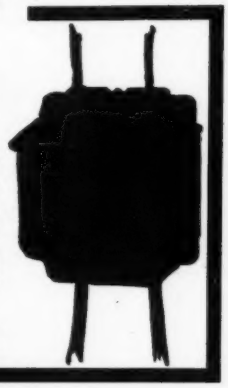
AMERICAN SIGN CO., Inc., KALAMAZOO, MICH.

SAVES 75 PER CENT

Packard

Sign Lamp Transformers

Will save that much in the cost of running electric signs—did you catch that?—75 per cent—75—not just 5 per cent, but **75.** You can get it because you can use the new high efficiency tungsten lamps—1.25 watts per candle power instead of 4.8 or 5. Folder tells it all out loud—nothing under cover but the works of the transformer. Guaranteed and approved.



The Packard Electric Co.
315 Dana Ave. WARREN, OHIO

New York Chicago

The Guarantee Protects You

Ask Your Dealer

Manhattan Electrical Supply Company

St. Louis, 1106 Pine St.

AMERICAN BRIDGE COMPANY OF NEW YORK

HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

Manufacturers of Steel Structures of all classes particularly **BRIDGES AND BUILDINGS**

Stock House—Minnesota Steel Co. New Duluth, Minn.

NEW YORK, N. Y., Hudson Terminal, 30 Church St.
Philadelphia, Pa., - Pennsylvania Building
Boston, Mass., Oliver Building, 141 Milk St.
Baltimore, Md., Continental Trust Building
PITTSBURGH, PA., - - Frick Building
Rochester, N. Y., - - - - Powers Block
Buffalo, N. Y., - Ellicott Square Building
Cincinnati, Ohio, - Union Trust Building
Atlanta, Ga., - - - Candler Building
Cleveland, Ohio, - - Rockefeller Building
Detroit, Mich., Beecher Ave. & M. C. R. R.

CHICAGO, ILL., Commercial National Bank Building
St. Louis, Mo., Third National Bank Building
Denver, Colo., First National Bank Building
Salt Lake City, Utah, - - Dooley Block
Duluth, Minn, - - - Sherwood Building
Minneapolis, Minn., 7th Ave. & 2d St., S. E.
Pacific Coast Representative:
U. S. Steel Products Co., Pacific Coast Dept.
SAN FRANCISCO, CAL., Rialto Building
Portland, Ore., - - - Selling Building
Seattle, Wash., 4th Ave. So., Cor. Conn. St.

Export Representative: United States Steel Products Co., 30 Church St., New York

THE STANDARD OF THE WORLD

TRADE **GONDA** MARK

The Leclanché Battery Co.

NEW YORK

GALES COMMUTATOR COMPOUND

50 Cents per Stick. $5.00 per Dozen

FREE Sample Stick

For Sale by All Supply Houses, or

K. McLENNAN & CO., Sole Manfrs., Room 409 Boyce Bldg., 112 Dearborn St., Chicago, Ill.

WANTED

You who are Troubled with Sparking and Cutting of Commutators to Use The only article that will PREVENT sparking. Will keep the commutator in good condition and Prevent Cutting. Absolutely Will Not Gum the Brushes It will put that high gloss on the commutator you have so long sought after.

POSITIONS WANTED

The rate for "Positions Wanted" advertisements of forty words or less is one dollar an insertion; additional words two cents each, payable in advance. Remittances and copy should reach this office not later than Monday 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

POSITION WANTED—Have had twenty years' experience at electrical construction, machinery, stations, and crane work. Can erect, repair, superintend, and handle help. Will travel or locate. Open for engagement June first. Address Box 1468, Electrical Review and Western Electrician, Chicago.

POSITION WANTED—With electric railway or light company. Two years' experience testing electrical apparatus with large electrical manufacturing company; several years with railways and lighting companies. Now in charge of operation of new uncompleted electric railway operating twelve miles. Address Box 1469, Electrical Review and Western Electrician, Chicago.

POSITION WANTED— Young man correspondent accountant with technical education, 20 years office and selling experience in electrical and technical lines, expert French and German translator, offers his services as assistant to contractor or similar position. Address Correspondent, P. O. Box 339, New York City.

HELP WANTED

The rate for "Help Wanted" advertisements of forty words or less is one dollar and fifty cents an insertion; additional words three cents each payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

WANTED— Experienced Designer on Single Phase Alternating Current Motors, 2 HP. and smaller. State technical training, experience and salary expected. Address, Box 1471, Electrical Review and Western Electrician, Chicago.

MISCELLANEOUS

The rate for "Miscellaneous" advertisements of forty words or less is one dollar and fifty cents an insertion; additional words three cents each, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

For Sale ONE 60 H. P. Fitzgibbons Type Boiler for 100 pounds working pressure. Boiler was used seven years, was continuously inspected by the Hartford Steam Boiler Insurance Company. Boiler has to be sold on account of change to internal combustion engine. Price $250.00 delivered on cars. E. Gutsch, Buffalo Center, Ia.

MACHINERY FOR SALE: 1 — 15 HP. Northern 500 volt Motor, $125.00.

1—20 HP. Westinghouse, 3-phase, speed 850, $180.00.

1—10 HP. Westinghouse, 3-phase, speed 850, $135.00.

1—10 HP. General Electric, 3-phase, speed 1,800, $125.00.

1—7½ HP. General Electric, 3-phase, speed 1,800, $95.00.

1—5 HP. Milwaukee, 500 volt, $55.00.

Snider Electric Co., 1626 So. Broadway, St. Louis.

FOR SALE—1—225 HP. Nordberg Cross Compound Condensing Corliss Engine, 12x22x36; 14 ft. rope pulley; 10 grooves; 1 1-8 in. rope. 1—125 K. W., 2 phase, 60 cycle, 2,200 volt Westinghouse Generator, with exciter and switchboard panel. The unit is immediately available, it being taken out to make room for a 1,000 K. W. steam turbine. For further particulars, address, Board of Public Works, Holland, Mich.

FOR SALE— 1-25; 1-15; 1-10; and 1-1 horsepower, G. E. motors, D. C., 220 volts, complete with pulleys, starting boxes and sliding base. Have been in use 2 years. Can be seen at J. Friedland & Co., 200 Huntington St., Brooklyn. For further particulars, apply to the B. & L. Electrical Contractors, Inc., No. 1555 E. 14th St., Brooklyn.

FOR SALE— A quantity of General Electric 6.6 Amp., series alternating current, inclosed arc lamp parts, consisting of magnet and armature coils, inner globes, dash pots, etc. Will sell any quantity at half price. Canton Gas & Electric Co., Canton, Ill.

FOR SALE— We have the following second-hand machinery in good operating condition which must be disposed of within the next thirty days to give possession of the building. Anyone desiring a real bargain will do well to wire us at once:

1—120 K. W. G. E. Alternator, 1100 V., 133 cycles, with pulley, rails, exciter and rheostat.

1—160 H. P. Westinghouse Automatic Compound Engine.

1—250 H. P. Westinghouse Automatic Compound Engine.

1—400 H. P. Westinghouse Automatic Compound Engine.

1—12-in. Austin Oil Separator.

1—7½x5x6 Worthington Duplex Pump.

3—9.6 Amp. Duncan D. C. Meters for series Arc Lamps.

Crawfordsville Electric Light & Power Co., Crawfordsville, Ind.

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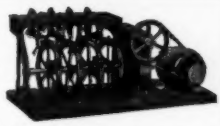
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Okonite Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Simplex Electrical Co.
Standard Underground Cable Co.
Waterbury Co.
Western Electric Co.

CABLE BELLS.
Electrical Engineers Equipment Co.
Fairmount Electric & Mfg. Co.
Standard Underground Cable Co.

CABLE CLIPS.
W. N. Matthews & Bro.

CABLE HANGERS.
A. & J. M. Anderson Mfg. Co.
Appleton Electric Co.
F. Bissell Co.
W. N. Matthews & Bro.
Mineraliac Electric Co.
Standard Underground Cable Co.
Yonkers Specialty Co.
Western Electric Co.

CABLE RACKS.
General Electric Co.
Standard Underground Cable Co

CABLE ROLLERS.
Fairmount Electric & Mfg. Co.
W. N. Matthews & Bro.

CABLE SPLICING JOINTS.
W. N. Matthews & Bro.

CABLE TERMINALS.
Fairmount Electric & Mfg. Co.
Standard Underground Cable Co.

CABLE TESTERS.
W. N. Matthews & Bro.
Mineraliac Electric Co.
Standard Underground Cable Co.

CABLES, Armored. (Flexible.)
Safety-Armorite Conduit Co.
Sprague Electric Works.
Standard Underground Cable Co

CABLING MACHINES.
New England Butt Co.

CALIBRATORS, Meter.
Fort Wayne Electric Works.
General Electric Co., Schenectady, N. Y.

CANOPY INSULATORS.
General Electric Co.
Mica Insulator Co.

CARBONS, Arc Light.
General Electric Co.
H. M. Hirschberg.
Koerting & Mathiesen.
National Carbon Co.
Hugo Reisinger.
Western Electric Co.
Westinghouse Electric & Mfg Co.

CARBONS, Battery.
Manhattan Electrical Co.
National Carbon Co.
Speer Carbon Co.

CAR HEATING, Electric.
Johns-Manville Co., H. W.
Simplex Electric Heating Co
Western Electric Co.

CAR LIGHTING SYSTEMS.
Gould Storage Battery Co.
United States Light & Heating Co.

CASTINGS.
Albert & J. M. Anderson Mfg. Co
Buffalo Foundry & Machine Co
Faries Mfg. Co.
Morris Iron Co., The.
New England Butt Co.
Triumph Electric Co.
Wallace Foundry & Mach. Co.

CEMENT, Cable Transformer.
Massachusetts Chemical Co.

CEMENT MACHINERY.
Allis-Chalmers Co.

CHANDELIERS.
Beardslee Chandelier Mfg. Co
Tungstolier Co.

CHANGERS, Inc. Lamp.
W. N. Matthews & Bro.
McGill Mfg. Co.

CHARGING OUTFITS.
Crocker Wheeler Co.
Cutler-Hammer Mfg. Co.
General Electric Co.

CHOKE COILS.
A. & J. M. Anderson Mfg. Co
General Electric Co.
Westinghouse Electric & Mfg Co.

CIGAR LIGHTERS.
General Electric Co.
Pittsburgh Electric Specialties Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

CIRCUIT BREAKERS, Automatic
Cutler-Hammer Mfg. Co.
Cutter Co.
Fort Wayne Electric Works.
General Electric Co.
Independent Electric Mfg. Co
Sundh Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

CLAMPS, Boltless Guy.
W. N. Matthews & Bro.

CLAMPS, Cable Supporting.
Electrical Engineers Eqiupment Co.
W. N. Matthews & Bro.

CLAMPS, Insulator.
Electrical Enineers Equipment Co.
Fairmount Electric & Mfg. Co.
Steel City Electric Co.

CLAMPS, Two Bolt Guy.
W. N. Matthews & Bro.

CLEATS, Fibre.
General Electric Co.
Blake Signal & Mfg. Co.

CLEATS, Insulating.
Hemming Mfg. Co.
Mineraliac Electric Co.

CLIMBERS, Linemen's.
Klein & Sons, Mathias.
Oshkosh Mfg. Co.
Western Electric Co.

CLOTH Insulating.
Massachusetts Chemical Co.
Mica Insulator Co.
Packard Electric Co.
Standard Paint Co.
Standard Underground Cable Co.
Westinghouse Electric & Mfg. Co.

CLASSIFIED INDEX—Continued

CLUSTERS.
Benjamin Electric Mfg. Co.
Faries Mfg. Co.
Federal Sign System (Electric).
Holophane Co.
McGill Mfg. Co.
Phelps Mfg. Co.
Shelby Electric Co.
Tilden Saw & Mfg. Co.
Western Electric Co.

COAL MINING MACHINERY.
Allis-Chalmers Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

COILS.
American Electrical Works.
Belden Mfg. Co.
D & W Fuse Co.
General Electric Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
W. R. Ostrander & Co.
P. R. Mfg. Co.
Shug Electric Mfg. Co.
Seidler-Miner Electric Co.
Stanley & Patterson.
Vote-Berger Co.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

COMMUTATOR LUBRICANTS.
Joseph Dixon Crucible Co.
Goldmark Co., James.
International Acheson Graphite Co.
McGill Mfg. Co.
E. McLennan & Co.

COMMUTATOR REPAIR CEMENT.
Plas-Mica Co.

COMMUTATOR TRUING DEVICES.
Jordan Bros.

COMPOUNDS, Boiler Cleansing.
Dearborn Drug & Chemical Co.
H. W. Johns-Manville Co.

CONDENSERS, Electric.
Leeds & Northrup Co.
Western Electric Co.

CONDENSERS, Steam.
Allis-Chalmers Co.
Westinghouse Mach. Co.

CONDUIT.
American Conduit Co.
American Conduit Mfg. Co.
Central Tube Co.
Clifton Mfg. Co.
C. S. Knowles.
Safety Armorite Conduit Co.
Sprague Electric Works.
Tubular Woven Fabric Co.

CONDUIT RODS.
F. Bissell Co.
Standard Underground Cable Co.
Western Electric Co.

CONDUIT, Underground. Clay, Composition, Wood.
American Conduit Co.
American Cross Arm Co.
H. B. Camp Co.
H. W. Johns-Manville Co.
McRoy Clay Works.

CONDUIT ENGINEERS & CONTRACTORS.
G. M. Gest.
Graner-Mahoney Contracting Co.
J. W. Turner Improvement Co.

CONSTRUCTION, Engineering.
Arnold Co.
Bates, Putnam A.
Byllesby & Co., H. M.
Central Station Engineering Co.
Electrical Engineers' Equipment Co.
Kelly Eng. Co., John F.
New England Engineering Co.
Stone & Webster Eng. Corp.
White & Co., J. G.
Zimmerman Co., W. H.

CONTROLLERS, Flat Rein.
Eclipse Electrical Mfg. Co.

CONTROLLERS Printing Press.
Allis-Chalmers Co.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Independent Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

COOKERS, Fireless Electric.
Copeman Electric Stove Co.
Detroit Fireless Stove Co.

COOKING DEVICES, Electric.
Copeman Electric Stove Co.
Cutler-Hammer Mfg. Co.
Despatch Mfg. Co.
Detroit Fireless Stove Co.
Federal Sign System (Electric).
General Electric Co.
Hughes Electric Heating Co.
Manhattan Electrical Supply Co.
Phelps Mfg. Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

COPPERS, Battery.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.

CORD, Braided.
Samson Cordage Works.

CRANES & HOISTS.
Allis-Chalmers Co.
Jordan Bros.
Sprague Electric Works.

CRANE MOTORS.
Crocker-Wheeler Co.
Ft. Wayne Electric Works.
General Electric Co.
Triumph Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CROSS ARMS. (Wood.)
American Cross Arm Co.
F. Bissell Co.
Lindsley Brothers Co.
Wm. Mueller & Co.

CURLING IRONS, Electric.
Pelouse Electric Heater Co.
Simplex Electric Heating Co.

CUT OUTS. Enclosed Fuse, Plug, Combination Rosette, Cut-Out Bases.
Chicago Fuse Mfg. Co.
Commonwealth Edison Co.
D & W Fuse Co.
Detroit Fuse & Mfg. Co.
E. H. Freeman Electric Co.
General Electric Co.
Hart Mfg. Co.
Geo. Heinemann & Co.
H. W. Johns-Manville Co.
Jordan Bros. Inc.
Manhattan Electrical Supply Co.
W. N. Matthews & Bro.
H. T. Paiste Co.
Pass & Seymour, Inc.
Trumbull Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CUT-OUTS, Arc Light.
T. H. Brady.
Fort Wayne Electric Works.
General Electric Co.
Philadelphia Elec. & Mfg. Co.

CUT-OUTS, Transformer.
D. & W. Fuse Co.
General Electric Co.
Pass & Seymour, Inc.
Westinghouse Electric & Mfg. Co.

DECORATIVE LIGHTING.
General Electric Co.
Manhattan Electrical Supply Co.
P R Mfg. Co.

DIRECT MOTOR DRIVES.
Crocker-Wheeler Co.
Electric Controller & Mfg. Co.
General Electric Co.
Triumph Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

DOOR SWITCHES.
Cutler-Hammer Mfg. Co.
Cutter Co.
Hart Mfg. Co.

DRIERS AND IMPREGNATORS.
Buffalo Foundry & Machine Co.

DRILLS AND BITS, Electricians, Morse Twist Drill & Machine Co.

ELECTRODES, Furnace.
National Carbon Co.
International Acheson Graphite Co.

ELECTRO-PLATING MACHINERY.
Crocker-Wheeler Co.
Ft. Wayne Electric Works.
General Electric Co.
Roth Bros. & Co.
Sprague Electric Works.
Westinghouse Electric & Mfg. Co.

ENGINEERS & CONTRACTORS.
American Bridge Co.
Arnold Co.
Badt-Westburg Electric Co.
Putnam A. Bates.
H. M. Byllesby & Co.
Central Station Engineering Co.
Central Station Heating & Construction Co.
Edward E. Clement.
Dixon-Smith Engineering Co.
Electrical Engineers' Equipment Co.
C. W. Humphrey.
D. C. & W. B. Jackson.
Kohler Bros.
Lamar Lyndon.
McMeen & Miller.
New England Engineering Co.
Chas. A. Pillsbury.
Sargent & Lundy.
Albert Schelble.
John Stone Stone.
Stone & Webster Engineering Corporation.
J. W. Turner Improvement Co.
Western Electric Co.
J. G. White & Co.
Woodmansee, Davidson & Sessions.
C. G. Young.
W. H. Zimmerman.

ENGINES, Gas and Gasoline.
Allis-Chalmers Co.
Westinghouse Machine Co.

ENGINES, Steam.
Allis-Chalmers Co.
Ridgway Dynamo & Engine Co.
Westinghouse Machine Co.

EXTINGUISHERS, Fire.
Goldmark Co., James.
H. W. Johns-Manville Co.

FANS, Motor and Disc.
Adams-Bagnall Electric Co.
Century Electric Co.
Colonial Fan & Motor Co.
Crocker-Wheeler Co.
Diehl Mfg. Co.
Emerson Electric Mfg. Co.
Fort Wayne Electric Works.
Fulton Bell Co.
General Electric Co.
Hunter Fan & Motor Co.
Manhattan Electrical Supply Co.
Mechanical Appliance Co.
Peerless Electric Co.
Robbins & Myers Co.
Sprague Electric Works.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FANS, Battery.
Carleton Co.

FAULT FINDERS, Electric.
Electric Controller & Mfg. Co.
W. N. Matthews & Bro.

FIREPLACES, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

FITTINGS, Conduit Terminals, Bushings, Entrance Caps.
Appleton Electric Co.
Crouse-Hinds Co.
Fairmount Electric & Mfg. Co.
H. T. Paiste Co.
Sprague Electric Works.
Troy Electric Co.
V. V. Fittings Co.

FITTINGS, Fixture (Brass).
Fairmount Elec. & Mfg. Co.
Faries Mfg. Co.

FIXTURES, Electric & Gas.
Frank Adam Elec. Co.
Adams, Bagnall Elec. Co.
Beardslee Chandelier Mfg. Co.
Faries Mfg. Co.
Federal Sign System (Electric).
Tilden Saw & Mfg. Co.
Tungstolier Co.
F. W. Wakefield Brass Co.
Western Electric Co.

FIXTURES, Indirect Lighting.
Federal Sign System (Electric).
National X-Ray Reflector Co.

FIXTURES, Show Case.
Benjamin Electric Mfg. Co.
H. W. Johns-Manville Co.
National X-Ray Reflector Co.

FLASHERS, Sign.
F. Bissell Co.
Eclipse Electrical Mfg. Co.
Phelps Mfg. Co.
Reynolds Electric Flasher Mfg. Co.

FLAT IRONS, Electric.
Cutler-Hammer Mfg. Co.
Diamond Electric Co.
General Electric Co.
Manhattan Electrical Supply Co.
Pelouse Mfg. Co.
Phelps Mfg. Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FLUXES, Soldering.
Blake Signal & Mfg. Co.
Burnley Battery & Mfg. Co.
Chicago Fuse Mfg. Co.
H. W. Johns-Manville Co.
McGill Mfg. Co.
Manhattan Electrical Supply Co.
Western Electric Co.

FUSE PLUGS.
Albert & J. M. Anderson Mfg. Co.
D. & W. Fuse Co.
General Electric Co.
H. W. Johns-Manville Co.
C. S. Knowles.
Stanley & Patterson.
Westinghouse Elec. & Mfg. Co.
Western Electric Co.

FUSE WIRE.
Appleton Electric Co.
General Electric Co.
Western Electric Co.

FUSES.
Chicago Fuse Mfg. Co.
D. & W. Fuse Co.
Detroit Fuse & Mfg. Co.
General Electric Co.
Johns-Manville Co., H. W.
Westinghouse Electric & Mfg. Co.

GAINS, Steel.
Belden Mfg. Co.

GEARS, Rawhide and Compositions.
Chicago Rawhide Mfg. Co.
General Electric Co.
New Process Raw Hide Co.

GENERATORS.
Allis-Chalmers Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Fort Wayne Electric Works.
General Electric Co.
Ridgway Dynamo & Engine Co.
Triumph Electric Co.
Westinghouse Electric Mfg. Co.

GLASSWARE, Illuminating.
Chicago Glass Novelty Co.
Haskins Glass Co.
Holophane Co.
Jefferson Glass Co.
National X-Ray Reflector Co.
Phoenix Glass Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

GLOBES, Arc Light. (Outer and Inner.)
General Electric Co.
Haskins Glass Co.
Phoenix Glass Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

GRAPHITE.
Joseph Dixon Crucible Co.
Holmes Fibre-Graphite Mfg. Co.
International Acheson Graphite Co.

GRAPHITED GREASE.
International Acheson Graphite Co.

GROUND CLAMPS.
Belden Mfg. Co.
Fairmount Electric & Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Hart Mfg. Co.
Geo. Heinemann & Co.
Mineraliac Electric Co.
H. T. Paiste Co.
Sprague Electric Works.
Thomas & Betts Co.
Western Electric Co.
Yonkers Specialty Co.

GROUNDING DEVICES.
Belden Mfg. Co.
Fairmount Electric & Mfg. Co.
Federal Sign System (Electric).

GUARDS, Inc. Lamp.
Benjamin Electric Mfg. Co.
McGill Mfg. Co.
W. N. Matthews & Bro.

GUY CLAMPS.
American Steel & Wire Co.
W. N. Matthews & Bro.

HANGERS, Conduit and Moulding.
Mineraliac Electric Co.
Western Electric Co.

HANGERS AND CLAMPS.
F. Bissell Co.
W. F. Irish Electric Co.
Mineraliac Electric Co.
W. R. Ostrander & Co.
Pass & Seymour, Inc.
Sprague Electric Co.
Standard Underground Cable Co.
Steel City Electric Co.
Thomas & Betts Co.

HEATERS, Electric.
Cutler-Hammer Mfg. Co.
Despatch Mfg. Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

HEATING SYSTEMS. Exhaust Steam.
American District Steam Co.

HOISTING MACHINERY. Electric Mine.
Allis-Chalmers Co.
General Electric Co.

HOSE, Rubber.
Diamond Rubber Co.

HOUSES, Pole or Pilot.
F. Bissell Co.

HYDRAULIC MACHINERY.
Allis-Chalmers Co.

INSTRUMENTS.
Bristol Co.
Electric Controller & Mfg. Co.
Eldredge Electric Mfg. Co.
W. & L. E. Gurley.
Leeds & Northrup Co.
W. N. Matthews & Bro.
Mineraliac Electric Co.
Fort Wayne Electric Works.
General Electric Co.
H. W. Johns-Manville Co.
Machado & Roller.
Manhattan Electrical Supply Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
Weston Electrical Instrument Co.

CLASSIFIED INDEX—Continued

INSULATING CEMENTS.
Dickinson Mfg. Co.
Massachusetts Chemical Co.

INSULATING MACHINERY.
New England Butt Co.

INSULATING PAINTS AND COMPOUNDS.
H. W. Johns-Manville Co.
McGill Mfg. Co.
Massachusetts Chemical Co.
Mica Insulator Co.
Mineralac Electric Co.
Plas-Mica Co.
The Standard Paint Co.
Standard Underground Cable Co.

INSULATION, Hard Rubber Composition, Etc.
Diamond Rubber Co.
Dickinson Mfg. Co.
Electrose Mfg. Co.
General Bakelite Co.
Hemming Mfg. Co.
Northern Industrial Chemical Co.
Vulcanized Products Co.

INSULATORS, Arc Lamp.
Albert A. & J. M. Anderson Mfg. Co.
General Electric Co.
H. W. Johns-Manville Co.
Morris Iron Co.

INSULATORS, Glass.
Brookfield Glass Co.
General Electric Co.
Hemingray Glass Co.
Locke Insulator Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, High Voltage.
Electrical Engineers' Equipment Co.
Electrose Mfg. Co.
Fairmount Electric & Mfg. Co.
General Electric Co.
H. W. Johns-Manville Co.
Locke Insulator Mfg. Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Wood.
Mineralac Electric Co.

IRIDIO-PLATINUM.
Baker & Co.

JARS, Battery (Glass).
Brookfield Glass Co.
Hemingray Glass Co.

JOINTS, Cable.
Dossert & Co.
General Electric Co.
W. N. Matthews & Bro.

JOINTS, Fixture Insulating.
Federal Sign System, Electric.
Thomas & Betts Co.

KITCHEN CABINETS.
Federal Sign System, Electric.

LACQUER, Metal.
General Bakelite Co.

LAMPS, Arc.
Adams-Bagnall Electric Co.
Albert A. & J. M. Anderson Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Koerting & Mathiesen.
Philadelphia Electrical & Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LAMP CHANGERS, or REPLACERS.
W. N. Matthews & Bro.

LAMPS, Incandescent Miniature, Carbon Filament, Metal Filament.
General Electric Co.
Monarch Incandescent Lamp Wks.
Packard Lamp Wks.

LAMPS, Incandescent.
American Electric Lamp Wks.
Banner Electric Wks.
Boston Incandescent Lamp Co.
Brilliant Electric Wks.
Bryan-Marsh Electric Wks.
Buckeye Electric Wks.
Colonial Electric Wks.
Columbia Inc. Lamp Wks.
Economy Electric Wks.
Fostoria Incandescent Lamp Works.
Franklin Electric Mfg. Co.
General Electric Co.
General Inc. Lamp Wks.
H. W. Johns-Manville Co.
C. S. Knowles.
Monarch Inc. Lamp Wks.
Munder Electric Wks.
New York Incandescent Lamp Co.
Packard Lamp Works.
Peerless Lamp Works.
Shelby Lamp Wks.
Standard Electric Wks.
Sterling Electrical Lamp Wks.
Sunbeam Inc. Lamp Wks.
Union Light & Supply Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
Westinghouse Lamp Co.

LAMPS, Vapor and Vacuum Tube.
Cooper Hewett Electric Co.
General Electric Co.

LIGHTING PLANTS.
Crocker-Wheeler Co.
General Electric Co.
General Electric Co.
Vote-Berger Co.
Westinghouse Electric & Mfg. Co.

LIGHTNING ARRESTERS.
Albert & J. M. Anderson Mfg. Co.
Delta-Star Electric Co.

LIGHTS, Desk.
Faries Mfg. Co.
Federal Sign System (Electric).
Johns-Manville Co., H. W.
Stanley & Patterson.
Vote-Berger Co.

LIGHTS, Stage.
F. Bissell Co.
Universal Elec. Stage Lighting Co.

LINE MATERIALS.
Ajax Line Material Works.
A. & J. M. Anderson Mfg. Co.
General Electric Co.
H. W. Johns-Manville Co.
Morris Iron Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LOCKERS, Metal.
Edward Darby & Sons Co.

LOCOMOTIVES, Electric
General Electric Co.
Westinghouse Electric & Mfg. Co.

LUBRICANTS.
Dearborn Drug & Chemical Works.
Joseph Dixon Crucible Co.
International Acheson Graphite Co.

LUGS.
Chicago Fuse Wire & Mfg. Co.
Crouse-Hinds Co.
Electrical Engineers Equipment Co.
Metropolitan Elec. Mfg. Co.
Trumbull Electric Mfg. Co.

MACHINE TOOLS.
Allis-Chalmers Co.
Mechanical Appliance Co.

MAGNETIC SWITCH CONTROLLERS.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Independent Electric Mfg. Co.
Sundh Electric Co.

MAGNETOS, MAGNETO-GENERATORS AND BELLS.
Manhattan Electrical Supply Co.
Western Electric Co.

MAGNETOS, Ignition.
General Electric Co.
Manhattan Electrical Supply Co.
Schug Electric Mfg. Co.

MAGNETS, Electro.
Automatic Electric Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Independent Electric Mfg. Co.
Manhattan Electrical Supply Co.
Sundh Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

MAGNETS, Lifting.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Independent Electric Mfg. Co.
Sundh Electric Co.
Western Electric Co.

MAGNETS, Permanent.
Automatic Electric Co.
Western Electric Co.

MARINE FITXURES.
Benjamin Electric Mfg. Co.
Crouse-Hinds Co.
General Electric Co.
Seidler-Miner Electric Co.
Yonkers Electric Mfg. Co.

MAST ARMS.
Ajax Line Material Works.
Brady Electric Mfg. Co.
Fort Wayne Electric Works.
Morris Iron Co.
Philadelphia Electrical & Mfg. Co.
Pittsburgh Transformer Co.

MATTING, INSULATING.
Massachusetts Chemical Co.

MEASURING MACHINES (For Wire Measuring).
Minneapolis Electric & Contruction Co.
New England Butt Co.

METAL FINISHING COMPOUNDS.
Gun Metal Finish Co.

METER COVERS, Glass.
Haskins Glass Co.

METERS, Recording.
Bristol Co.
General Electric Co.

MICA.
Mica Insulator Co.
Eugene Munsell & Co.
Plas-Mica Co.
United Mica Co.

MINING MACHINERY (Motor Driven).
Allis-Chalmers Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

MOTORS AND DYNAMOS.
Advance Electric Co.
Allis-Chalmers Co.
Century Electric Co.
Colonial Fan & Motor Co.
Crocker-Wheeler Co.
Diehl Mfg. Co.
Eck Dynamo & Motor Co.
Emerson Electric Mfg. Co.
Ft. Wayne Electric Works.
General Electric Co.
Mechanical Appliance Co.
Peerless Electric Co.
Richmond Electric Co.
Ridgway Dynamo & Engine Co.
Robbins & Myers Co.
Roth Bros. & Co.
Sprague Electric Works.
Triumph Electric Co.
Troy Electrical Co.
Wagner Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

MOULDING.
H. T. Paiste Co.
Stanley & Patterson.
Trumbull Electric Mfg. Co.

MOUTH PIECES, Glass.
Stromberg-Carlson Tel. Mfg. Co.

NAME PLATES.
Schwerdtle Stamp Co.

OFFICE ACCESSORIES (Motor Driven).
Vote-Berger Co.

OZONIZERS.
Federal Sign System (Electric).
General Electric Co.

PACKING, Steam.
Clifton Mfg. Co.
Diamond Rubber Co.
H. W. Johns-Manville Co.
New York Insulated Wire Co.

PAINTS, Preservative.
Joseph Dixon Crucible Co.
H. W. Johns-Manville Co.
Massachusetts Chemical Co.
The Standard Paint Co.
Western Electric Co.

PATENT SOLICITORS.
Foree Bain.
Edward E. Clement.
Edw. S. Duvall.
Siggers & Siggers.

PHOTOMETERS, Lamp Testing.
Leeds & Northrup Co.
W. & L. E. Gurley.
Thompson-Levering Co.

PHOTOMETER STANDARDS.
Electrical Testing Laboratories.

PIGTAILS AND FLEXIBLE LEADS.
Belden Mfg. Co.
Rome Wire Co.

PINS AND BRACKETS, Wood.
American Cross-Arm Co.
F. Bissell Co.
Electrical Engineers Equipment Co.
Wm. Mueller & Co.
Oshkosh Mfg. Co.

PIPE COVERINGS, STEAM.
American District Steam Co.
H. W. Johns-Manville Co.

PIPE FITTING TOOLS.
Steel City Electric Co.

PLATES, FLUSH SWITCH.
Machen & Mayer Electrical Mfg. Co.

PLATFORMS (Pole Seats).
F. Bissell Co.
Oshkosh Mfg. Co.

PLATINUM.
American Platinum Works.
Baker & Co., Inc.

PLIERS, Wire Cutting.
H. W. Johns-Manville Co.
Mathias Klein & Sons.

PLUGS AND RECEPTACLES, Flush.
Chelten Elec. Co.
General Electric Co.
Hart Mfg. Co.
Machen & Meyer Electrical Mfg. Co.
Manhattan Electrical Supply Co.
Metropolitan Elec. Mfg. Co.
H. T. Paiste Co.
Trumbull Electric Mfg. Co.

PLUGS AND RECEPTACLES, Stage.
Frank Adams Electric Co.
General Electric Co.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Universal Electric Stage Lighting Co.
Western Electric Co.

POLES, Concrete.
American Steel & Wire Co.

POLES, Iron and Steel.
Franklin Steel Co.
Morris Iron Co.

POLES, Treated.
Lindsley Bros. & Co.
Page & Hill Co.
Valentine-Clarke Co.

POLES, Wood.
F. Bissell Co.
Crawford Cedar Co.
Duluth Log Co.
Lindsley Bros. Co.
Mueller & Co., Wm.
National Pole Co.
Naugle Pole & Tie Co.
Page & Hill Co.
Partridge Lumber Co., T. M.
Sterling & Son Co., W. C.
Torrey Cedar Co.
Valentine-Clark Co.
Western Electric Co.
C. H. Worcester Co.

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Kellogg Switchboard & Supply Co.

POLE ERECTORS.
W. N. Matthews & Bro.

POLE STEPS.
American Steel & Wire Co.
Albert & J. M. Anderson Mfg. Co.
Morris Iron Co.
Oshkosh Mfg. Co.

POLETOPS, Arc Lamp.
Morris Iron Co.

PORCELAIN, Special Shapes.
Colonial Sign & Insulator Co.
Findlay Electric Porcelain Co.
Locke Insulator Mfg. Co.
Pass & Seymour, Inc.
Star Porcelain Co.

PORCELAIN, Standard.
Colonial Sign & Insulator Co.
Cook Pottery Co.
General Electric Co.
Pass & Seymour, Inc.
Star Porcelain Co.

PORTABLES, Electric Reading Lamps.
Faries Mfg. Co.
H. W. Johns-Manville Co.
Vote-Berger Co.

POSTS, Lamp.
Adams-Bagnall Elec. Co.
Cutter Co., George.
Flour City Ornamental Iron Works.
McDonnell Boiler & Iron Works.
Morris Iron Co.
Wallace Machine & Foundry Co.

POTENTIOMETERS.
Leeds & Northrup Co.

POTHEADS AND SLEEVES.
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T. H. Brady.
Colonial Sign & Insulator Co.
Electrical Engineers' Equipment Co.
Fairmount Elec. & Mfg. Co.
General Electric Co.
Mineralac Electric Co.
Okonite Co.
Standard Underground Cable Co.

PRESERVATIVES, Wood.
Carbolineum Wood Preserving Co.
General Bakelite Co.
Lindsley Brothers Co.

PRINTING ATTACHMENTS FOR METERS.
Mineralac Electric Co.

PRODUCERS, Gas.
Allis-Chalmers Co.
Westinghouse Machine Co.

PROJECTORS, Electric. (Search Lights.)
Fort Wayne Electric Works.
General Electric Co.

PROJECTORS, Sign.
Pittsburg Electric Specialties Co.

PROJECTORS, Telephone.
D. & W. Fuse Co.

PYROMETERS, Electric.
Bristol Co.
Leeds & Northrup Co.
Thompson-Levering Co.

PULLEYS, Arc Lamp.
Ajax Line Material Works.
Fort Wayne Elec. Works.

PUMPS, Water.
Allis-Chalmers Co.
Fort Wayne Engineering & Mfg. Co.

PUSH BUTTONS.
Cutler-Hammer Mfg. Co.
Manhattan Electrical Supply Co.
Pass & Seymour, Inc.
Western Electric Co.

RACKS AND RINGS, Telephone Distributing.
F. Bissell Co.

RADIATORS, Luminous.
General Electric Co.

RAIL BONDS.
General Electric Co.
H. W. Johns-Manville Co.
Rail Joint Co.
John A. Roeblings Sons Co.
Western Electric Co.

RAIL JOINTS.
Rail Joint Co.
Western Electric Co.

RAILWAY SPECIALTIES, Electric.
A. J. & M. Anderson Mfg. Co
Blake Signal & Mfg. Co.
General Electric Co.

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H. W. Johns-Manville Co.
Morris Iron Co.
Oshkosh Mfg. Co.
Rail Joint Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

RECEPTACLES, Sign.
Benjamin Electric Mfg. Co.
Crouse-Hinds Co.
Federal Sign System (Electric).
E. H. Freeman Electric Co.
General Electric Co.
H. T. Paiste Co.
Pass & Seymour, Inc.
Stanley & Patterson.

RECEPTACLES, Weatherproof.
Crouse-Hinds Co.
Federal Sign System, Electric.
E. H. Freeman Electric Co.
General Electric Co.
H. T. Paiste Co.
Pass & Seymour, Inc.
Stanley & Patterson.

RECTIFIERS.
General Electric Co.
Mohawk Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

REELS, Wire.
Mathias Klein & Sons.
Minneapolis Elec. & Const. Co.
Oshkosh Mfg. Co.

REFLECTORS, Mirror.
National X-Ray Reflector Co.
Reynolds Electric Flasher Mfg. Co.

REPAIRS, Armature.
Commonwealth Edison Co.
Waterbury Co.
Westinghouse Electric & Mfg. Co.

RESISTANCE, Banks and Units.
Allen-Bradley Co.
Cutler-Hammer Mfg. Co.
Dixon Crucible Co., Joseph.
General Electric Co.
Independent Electric Mfg. Co.
Sprague Electric Co.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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Belden Mfg. Co.
Driver-Harris Wire Co.
Moore, Alfred F.

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Independent Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

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Cutler-Hammer Mfg. Co.
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General Electric Co.
Independent Electric Mfg. Co.
Sundh Electric Co.
Sprague Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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American School of Correspondence.

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SECOND HAND MACHINERY.
Archer & Baldwin.

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Bridgeport Brass Co.
Bryant Electric Co.
General Electric Co.
J. E. M. Shadeholder Co.
Western Electric Co.

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Faries Mfg. Co.
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Holophane Co.
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Chicago Glass Novelty Co.
Colonial Sign & Insulator Co.
Federal Sign System (Electric).
Moore Light Co.
Phelps Mfg Co.
Reynolds Electric Flasher Mfg. Co.
Universal Elec. Stage Ltg. Co.

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Belden Mfg. Co.
Johns-Manville Co., H. W.
Standard Underground Cable Co.

SLEEVES, Paper.
Standard Underground Cable Co.

SMOKESTACKS, Steel.
Minneapolis Steel & Machinery Co.

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Benjamin Electric Mfg. Co.
Bryant Electric Co.
Cutler-Hammer Mfg. Co.
Federal Sign System (Electric).
Freeman Electric Co.
General Electric Co.
Johns-Manville Co., H. W.
C. S. Knowles.
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Phelps Mfg. Co.
Philadelphia Electric & Mfg. Co.
Trumbull Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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Western Electric Co.
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American Steel & Wire Co.
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Sundh Electric Co.
Universal Stage Lighting Co.

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Babcock & Wilcox Co.
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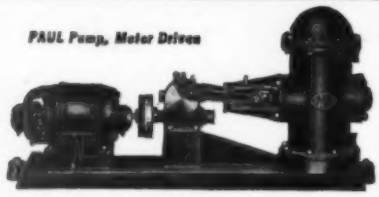

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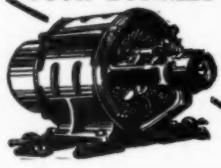

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render satisfactory service under all conditions. They will build up a good business for you. Write for terms and additional information contained in Bulletin No. 14. Address Department "A".

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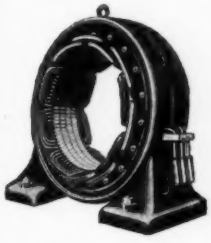
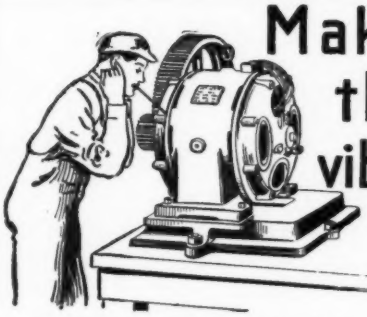


Ask for Bulletin 431

The Triumph Electric Co.

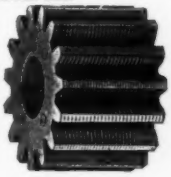
Cincinnati, Ohio
Branches in principal cities

Make this vibration test



Press one end of a steel rod against the frame of a machine near the gears; hold the other end of the scale between your closed teeth and put your hands over your ears. Do this near any high speed metal to metal gear drive and then on a drive where a New Process Rawhide Pinion has been substituted for the metal one.

This is similar to the test often used to locate knocks in gas engine cylinders and will demonstrate just as well the harshness of metal to metal gear tooth contact as compared to metal to New Process Rawhide contact. The bumping into contact and consequent vibration of metal to metal is clearly audible in this way, while the contrasting smoothness of metal to rawhide is strikingly noticeable.



If you are pestered with gear noises and want to stop them; if bolts on yourimachines are loosening and the parts are rattling because of excessive v bration, write our engineers for expert advice. By all means get ourliterature 49

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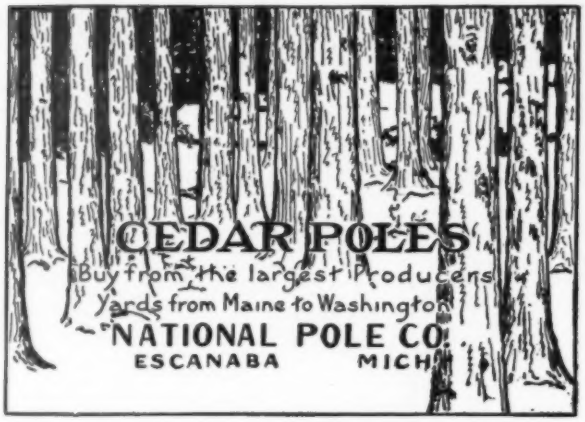

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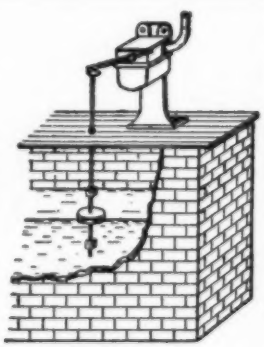

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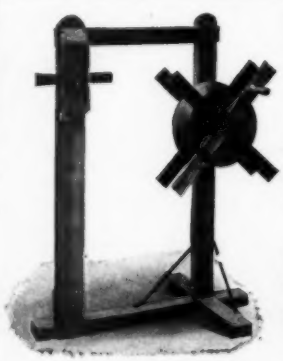

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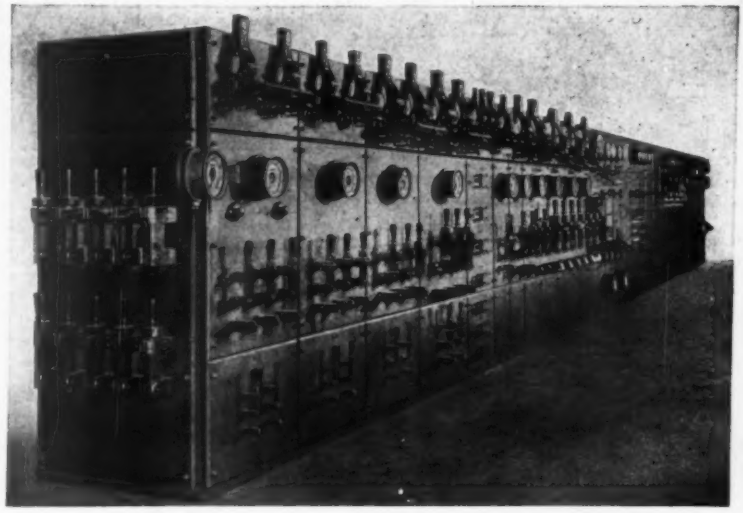

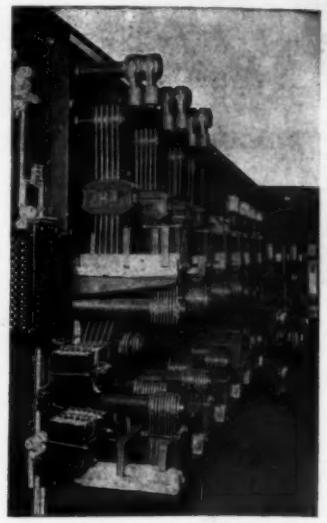

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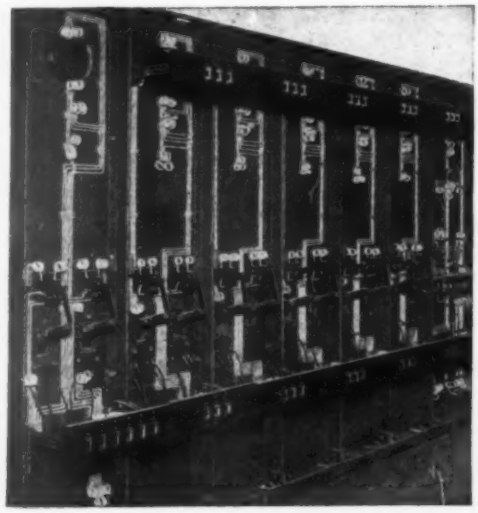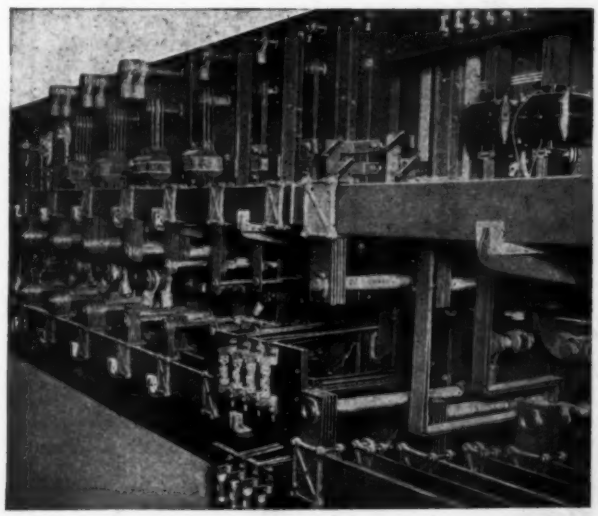
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